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ABSTRACT

This manual represents an attempt to summarize and organize the intellectual content of physical education (i.e., the facts and understandings upon which the exercises and activities of the physical education programs are based). It is designed for a two-fold purpose: (1) to serve as a basis of instruction which lends itself to evaluation through written tests (in particular, the standardized tests being developed by Educational Testing Service of Princeton in conjunction with AAHPER), and (2) to be used, evaluated, and refined by classroom teachers and physical education specialists. The essential skills and concepts of physical education are outlined under three major headings (Activity Performance, Effects of Activity, and Factors Modifying Participation in Activities and Effects of Participation). Each item is accompanied by "factual statements describing the skill or concept, stating its importance, analyzing it scientifically, and noting its application or relationship to performance." Each concept has been graded according to its appropriateness for the elementary, junior, and/or senior level of instruction, so that there is a progression from the simple to the more complex concept. Also included are brief reviews of the nature and use of standardized tests and of the manual itself. (Author/ES)

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KNOWLEDGE AND UNDERSTANDING IN PHYSICAL EDUCATION

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PREFACE

This manual is a pioneer effort in setting down the body of knowledge for physical education. It is the result of the teacher's need for clearcut statements of the facts and understandings underlying the exercises and activities in the physical education program. The how and why of what is done have often been the missing ingredients in physical education instruction. The contents of this manual attempt to supply these knowledges and understandings and provide the basis on which students may be evaluated through standardized tests now under construction.

The project culminating in this manual began several years ago as an Association effort to prepare sports knowledge tests. A committee met several times and corresponded extensively to fulfill its charge to structure and define sports knowledge, but gradually the objectives and pattern of operation changed. Other developments in the profession and new information and research results both in general education and in physical education made it more urgent to encompass the entire body of knowledge in physical education.

The name was changed to Physical Education Knowledge Test Project and the foundation was laid for the present manual. A question was soon raised as to whether AAHPER should administer the proposed test program or whether it should be placed in the hands of one of the nationally recognized test service corporations to be used closely with standardized tests in other areas of the school curriculum. The decision was to make use of a national testing organization, and the Educational Testing Service of Princeton, New Jersey, agreed to accept the task of preparing the tests. The work of the committee then became focused on preparation of the appropriate body of knowledge.

An outline of main sections, and the subtopics for each, was worked out by the committee in full. Three members undertook responsibility for preparing material for each of three main subdivisions, as follows: Katherine Ley, Activity; Raymond A. Weiss, Effects of Activity; Dorothy Mohr, Factors Modifying Activities. Subsequently, the work of these three individuals was reviewed and refined by others in the committee, by outside experts, and by the AAHPER headquarters staff. An introductory chapter was prepared by Elizabeth Ludwig and a final chapter on constructing and using standardized tests was written by Raymond A. Weiss.

Leonard A. Larson has served as chairman of the committee from the inception of the project. It has been a total Association responsibility, although members of the committee are members of the Research Council and have kept the Council informed of progress along the way. AAHPER gratefully acknowledges the assistance given by the many members of the profession who have contributed in some way to the development of this manual.

The final document is offered by AAHPER as a first step toward defining the body of knowledge in physical education. It is our hope that the manual will be used by teachers and evaluated for the purpose of future refinement. A primary purpose is to serve as the basis of instruction lending itself to evaluation through written tests, but its ultimate purpose is to improve understanding of the broad field of physical education. Criticisms and comments from those in the profession who use this manual are welcomed by the Association.

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WHY TEACH A BODY OF KNOWLEDGE IN PHYSICAL EDUCATION?

INTRODUCTION

The contents of this manual are directed to the classroom teacher and to the physical education specialist. Both are interested in and responsible to some degree for the physical education of children and youth.

The term physical education as used here is not limited to the traditional concept of a program of activities set up to teach children a prescribed number of games, dances, stunts and tumbling, gymnastics, and the like, with the hope that certain values such as physical fitness, cooperation, leadership, and similar general desirable characteristics and qualities would result. Rather, physical education is used to indicate not only a program but a process as well — a process in which the product (the student) is the point of focus. The term "education" then becomes the key word and the school program in physical education will include an emphasis on *all* aspects of the subject area that contribute toward total development, using the best teaching procedures known in order to accomplish the task. It will include the knowledge and understandings involved in performance, the development of skills in specific activities chosen to accomplish certain purposes, and an emphasis on the inherent and planned-for values related to the individual's developmental needs (physiological, psychological, and sociological).

It cannot be emphasized too strongly that physical education is basically an *activity* program, for herein lies its strength as a school subject and a teaching tool. No one can dispute the tremendous importance of physical activity in early childhood as the source of knowledge of the world around us. All of the early concepts of how to deal with space, time, and force are acquired through actually coping with these factors as the child moves in his crib, as he reaches for objects, pulls himself up, rolls over, kicks, and finally walks, runs, and climbs. As the child develops, however, the reason "why" and the recognition of "how" become increasingly important to a complete understanding of fundamental facts, principles, and procedures that assist in the development of skills of motor performance. Values related to both personal needs and the needs of others are gradually recognized by the child and play an important part in growth toward maturity.

The need for teaching a body of knowledge in physical education appears indisputable, then, if the school accepts its responsibility to assist the individual to develop his potential, by giving him not only the skills but the background for knowing "how" and "why," so that he may continue to grow throughout his lifetime. The baby learns through exploration and experimentation, but as the content of physical education becomes more complicated, there is a real need for assisting the boy and girl in every way possible — not only through opportunities for performance and the practice of desirable behavior but also through the acquisition of knowledge fundamental to these activities.

In addition to the scientific facts and principles underlying the acquisition and performance of motor skills and organized activities, this body of knowledge logically includes an understanding of the organic requirements for power, skill, and endurance, the values and hazards inherent in physical activity, procedures for proper and safe participation, and the understandings essential for the individual's assuming responsibility in personal planning for good health and well-being.

The contents of this manual and the tests to go with it represent as complete a presentation as possible at this time of all the concepts and knowledge basic to the accomplishment of the objectives of physical education. These objectives have been stated in many ways by educators and physical educators alike, but fundamentally they resolve themselves into the following categories:

Physiological objectives — the development of strength, endurance, a healthy nervous system, normal organic and physiological functioning.

Motor skill objectives — the development of ability to handle the body skillfully, efficiently, and safely in one's daily vocational activities (including body mechanics involved in posture, pushing, pulling, lifting, etc.), and in recreation of a physical nature, including sports, dance, and aquatics.

Intellectual objectives — the acquisition of knowledges and concepts fundamental to the performance of activity, to the development of aesthetic values, to the development of total fitness, to safe adventuring in the out-of-doors, etc.

Aesthetic objectives—the development of an appreciation for the skillful performance of others, and the ability to appreciate the joy of movement in oneself for its own sake, as well as to recognize fine movement in art forms such as sculpture, painting, and music.

Social objectives—the development of such desirable traits as good sportsmanship, cooperation in the solution of common problems, recognition of the rights of others, acceptance of responsibility for personal behavior affecting the group, and similar social behaviors which are the basis for group living in a democracy.

Although the intellectual objectives are listed in parallel order to the four other categories, they actually undergird the entire structure. They provide the "how" and the "why" of the skill learning process and the activity which results. They are also important because they have value in themselves as adjuncts to the physically educated person.

To assist the individual toward the achievement of the stated objectives will require the finest kind of teaching and learning in the school physical education program. Periodic evaluations by way of skill tests and written tests are essential, if progress is to be accurately measured.

ORGANIZATION AND FUNCTION OF THE MANUAL

The organization of this manual has been planned to meet the needs of the classroom teacher in addition to those of the physical education specialist. It is recognized that the preparation of the classroom teacher in the specific field of physical education may be limited to a course or two, at most. For many, even this much preparation is lacking. On the other hand, classroom teachers are usually well informed in one or two of the science areas, they have good backgrounds in child growth and development, and they have had foundation courses in psychology and sociology.

It should be an exciting and rewarding experience for the classroom teacher to discover that many concepts gleaned from such background courses are applicable to the teaching of physical education. The logic of this kind of teaching and learning is particularly gratifying to the teacher who sees the child as a totality and who is basically concerned with child growth and development.

ORGANIZATION AND FUNCTION OF THE MANUAL

GENERAL ORGANIZATION

The body of knowledge included in the manual is patterned as follows:

Part I. *Activity Performance*
- Basic sports skills
- Body mechanics
- Concepts fundamental to movement skills in strategies and activity patterns
- Rules and procedures
- Protective requirements

Part II. *Effects of Activity*
- Immediate effects
  1. Physiological responses
  2. Fatigue and impairment
- Long term effects
  1. Health and appearance
  2. Correction of functional defects
  3. Weight control
  4. Development of body symmetry
  5. Capacity for effort
     - Muscular strength
     - Muscular endurance
     - Circulatory-respiratory endurance
  6. Effective utilization of capacity for skills
     - Development of posture
     - Development of skills
     - Development of relaxation
  7. Effective social behavior
     - Respect for rules
     - Respect for officials
     - Sportsmanship
  8. Self-realization and development of values
     - Individual regard for self
     - Reason and intelligence
     - Initiative, courage, and perseverance
     - Understanding of physical environment
     - Cultural values
     - Aesthetic and artistic values

Part III. *Factors Modifying Participation in Activities and Their Effects*
- Age and maturation
- Attitudes
- Sex differences
- Environmental forces
- Skill levels
- Physical condition
- Nutrition
- Fatigue
- Stress
- Performance aids
- Smoking
- Alcohol
- Drugs

Factual statements describing the skill or concept, stating its importance or values, analyzing it scientifically, and noting its application or relationship to performance are presented under each of the foregoing outline items.

Material is graded

All of the concepts have been graded as logically as possible so that there is a progression from the simple to the more complex concept. Of necessity this grading of material is a matter of judgment of the individuals who formulated the statements. In specific situations and under varying conditions these progressions will be altered, based on the judgment of the instructor. It is reasonable to believe that a concept could be introduced on the primary level, stated in terms that a child of this age could understand and work with, and then stressed again in the intermediate grades when a more scientific approach is taken. On the high school level the scientific principles involved might be studied in depth, and applications of the principles broadened in scope.

The language used in describing or stating the concept is not always the language that the teacher would use in presenting the material to the students. The "translation" of the statement into language that the child can understand is the responsibility of the teacher.

Specific sports, games, or dances are not analyzed in detail

It should also be noted that no attempt is made to describe all the concepts underlying individual activities, such as specific sports, gymnastics, etc., except as illustrations and applications are made to specific activities for clarification purposes. Specific and detailed information related to such activities as basketball, volleyball, stunts and tumbling, and folk dancing can be found in many excellent references available to all teachers and students. The purpose of this manual is to locate the principles, procedures, and mechanics common to many structured activities and point up their application to selected illustrations, so that the teacher and student can be given a sound basis for analysis. It is hoped that, as new activities are learned, the student will be able to apply the fundamental concepts with which he is already familiar, and thereby simplify and expedite the learning of new activities. Pointing out relationships and references to fundamental principles and procedures is an important job of the teacher.

USING THE MANUAL IN TEACHING AND IN TESTING

To use the manual effectively, it is suggested that the teacher familiarize himself in a general way with its entire content. The teacher in the elementary school will be mainly interested in those understandings designed as applicable to the elementary age child. He should also have a comprehensive understanding of what the student in the junior and senior high school grades is expected to know, as he must provide the foundation for this learning. When teaching certain concepts on the elementary level, the teacher may be able to help the children look ahead to their future experiences. Similarly, the teacher of junior high school age children should know what his pupils have been exposed to on the elementary level and what they will be expected to learn on the senior high school level. Pointing up interrelationships, showing students how the same basic concepts may be illustrated in the simple as well as more complex activities, and assisting students to analyze newly presented skills and activities for the mechanical principles and problems which are involved should be the responsibility of every teacher involved in teaching these activities.

When the teacher plans to develop a specific skill or activity, he should be able to locate in this manual those concepts involved that need to be presented for the first time or as a review. For example, if the elementary school teacher plans to introduce some activity involving the skills of throwing and catching a ball, he may refer to that section of the manual presenting the basic mechanics involved. If the activity is a game, it might also call for some basic play strategies that are common to many games. These are presented in the section on strategies and activity patterns. The teacher may also feel that the activity presents a good opportunity, either directly or indirectly, to teach certain understandings about the effects of the activity.

Planning for the teaching of fundamental concepts is extremely important. No teacher, however skilled, is able to rely solely on his general knowledge and experience, if he takes seriously his responsibility for teaching basic understandings as well as presenting the obvious skills involved. The teacher must plan resources, insights, demonstrations, and knowledges to direct the individual toward accomplishment of the objectives of a unit of instruction. Objectives should be set by the teacher and student, and the student should know his role in accomplishing the tasks. The student has a large share in the teaching-learning process and should be held responsible for doing his best toward meeting the objectives agreed upon.

CONTENT AND TESTING OF KNOWLEDGE

Physical education is primarily an activity program and many of the objectives of the program are accomplished through activity. Proof of learning will be evidenced largely in the actual performance of a skill or a game or a dance. This manual does not propose to minimize the importance of these physical performance skills and tests; rather it emphasizes the importance of basic understandings to the achievement of all the objectives of physical education, including skill in physical activity.

Knowledge and understandings have always been considered essential elements in the teaching of physical education, but many teachers have assumed that these objectives were being achieved without seeking any direct evidence of the fact. Present-day pressures for the re-examination of curriculum and procedures demand that more attention be given the creative use of the intellect in physical education. The intellectual, the verbally expressive content of physical education is as significant as the motor content, and needs to be assessed. In appraising the student's progress in physical education, therefore, evidence should be obtained of the acquisition of knowledges and understandings in addition to the mastering of physical skills.

Written tests then become *another* means of checking progress in the achievement of specific objectives of units of instruction and in teaching toward the broader goals of physical education. A good teacher will use written tests to help the child see his accomplishments as well as his weaknesses in learning concepts that are important in specific units of instruction. For example, in the learning of a game such as soccer (even simplified for the fourth grader), knowledges of rules, strategies, mechanics of ball handling, importance of developing endurance, and the relationship of sleep, nutrition, and other factors to performance level are necessary for optimal learning. It is important to the student and the teacher to know how far along the student has come toward accomplishing these objectives, and one way of estimating such progress is through the use of written tests.

Such examinations can be significant teaching aids. The teacher can more accurately diagnose the students' needs for instruction and gear teaching to the proper level. The actual writing of the test can be a learning experience. Tests help in stressing important points and assist students to make inferences, see relationships, and then apply knowledge to new situations. This is especially true if the test items stimulate critical and creative thinking, not just the repetition of memorized facts.

Knowledge tests present evidence concerning the degree of comprehension of the intellectual content of physical education. They may be used to determine the effectiveness or deficiencies of the teaching procedures and content and to measure students' abilities to analyze skills, game situations, dance steps, etc. Information may be obtained about the competency of students to make efficient use of facts and concepts in their approach to planning strategy and organizing data. Test items may be constructed that will measure abilities to solve problems related to physical education experiences, including athletic contests, and measure students' understandings of how specific techniques of movement are applied, how complicated skills are developed from basic principles of movement, how rules are interpreted in game situations, and how physical, physiological, and environmental influences affect movement. Ability in verbalizing such understandings is one mark of the physically educated individual.

Each teacher needs to construct tests for his specific purposes, molding them to meet the needs of his students. The use that is to be made of the test will affect the choice of the type of examination, the categories of test items (essay questions, multiple choice, alternate response, matching items, simple recall, identification), the degree of difficulty, and the amount of detail involved. The test should accurately reflect the objectives of the unit of instruction and the relative emphases placed on each phase of the experiences provided during the unit.

In addition to the teacher-made tests designed to measure teaching emphasis, standardized secure tests will be available. These tests are being prepared by Educational Testing Service, Princeton, New Jersey, and will be ready for use in 1970. They are designed to measure the content that should be achieved by students at the sixth, ninth, and twelfth grade levels. This program is a part of the regular academic testing program designed by ETS and is recommended for use by the classroom teacher and the physical education specialist. (See Part IV, page 117.)

Part I / ACTIVITY PERFORMANCE

BASIC SPORTS SKILLS

The performance of tasks, whether the tasks be associated with existence and survival, or participation in sports and recreational activities, requires the ability to execute certain fundamental movements or fundamental skills. Seldom would one of these skills be utilized exclusively; usually two or more skills are combined or coordinated to become complex skills that are incorporated into the lives of individuals.

Nine fundamental movements or skills considered basic to physical activity are included in the first section. Certain other skills or abilities which are fundamental to strategy and/or the movement patterns of activities in which there is no direct competition are included in the next section. These fundamentals can be combined in a number of ways to produce a great number of complex skills. Each combination is determined by the purpose or goal the individual seeks to achieve. In other words, physical education activities require the ability to apply the fundamentals in many, many ways. It is therefore assumed that knowledge of performance of basic skills is a vital and universal need of students in physical education.

Skills basic to sports are identified, as follows:

1. Running
2. Jumping
3. Hopping
4. Leaping
5. Throwing
6. Striking
7. Kicking
8. Catching
9. Swimming

RUNNING

Running is a skill basic to many human functions and is different enough from walking to be considered as a separate skill.

ELEMENTARY The foot is placed under the center of gravity.

The force required to run is obtained by extending the supporting leg and pushing off from the toes; then transferring the weight to the other leg which has been extended forward.

The force of the landing is absorbed by flexing the knee, ankle, and hip joints. The arms swing in opposition to the legs.

Running is used as a means of locomotion by most people every day, as an element in many sports activities, as an indication of fitness and motor ability, or as a type of competitive event.

If the knee is not flexed and lifted, the leg must be swung in a lateral arc.

The elbows should be bent, which allows the arms to move faster because the lever has been shortened.

The bent arms should be allowed to swing; if held close to the body, there is a tendency to rotate the shoulders excessively.

JUNIOR There is a period of no support during the run, and no period of double support as in the walk.

In a fast run, the ball of the foot hits the ground first because the center of gravity is kept over the forward edge of the base.

In running for speed, the start is extremely important because maximum speed must be achieved quickly.

ELEMENTARY Although a crouch start is the best for getting a quick start, a forward-backward stride is next best.

The body leans forward to allow a rapid upsetting of stability in a forward direction.

Short steps are used in the start and then the stride is lengthened.

JUNIOR In the dash, speed is the objective from start to finish.

In the start, a crouch position is assumed with the center of gravity raised high and moved forward over the fingertips; the feet placed against the starting blocks; the hands raised to upset the stability; and the feet pushed in the line of intended direction as the trunk is extended forward and slightly upward.

In a forward-backward stride start, the weight is centered over the ball of the rear foot and the start is begun by leaning forward and pushing off the rear foot.

Centrifugal force makes the running in a circle or an arc more complex than running in a straight line.

JUNIOR The body leans in toward the center of the circle or arc to counteract centrifugal force.

The push of the legs is slightly outward as well as down and back.

Often a run must be made on a circular track, and in some sports (such as baseball), an arc is involved in making a run.

The body should lean in toward the center of a track, or toward the infield in running bases, to shorten the arc of the run.

If a surface is slippery, the friction between the runner's feet and the surface is reduced.

JUNIOR Slipping, with subsequent injury, is less likely if friction is high.

Special shoes should be worn in such activities as track, football, and field hockey, to increase the traction between the feet and surface.

SENIOR If the coefficient of friction is high between the runner's feet and the surface, more of the runner's force can be converted to use.

If a surface is slippery, the coefficient has been reduced.

In middle and long distance runs, endurance is important.

ELEMENTARY A forward-backward stride is often used as a starting position.

Conservation of energy is important in completing a distance run.

The body is carried in a more erect position to allow sufficient ventilation of the lungs.

The arms and shoulders are somewhat relaxed to help conserve energy.

JUMPING

Jumping is an activity in which young children participate recreationally at an early age; they later use jumping in a variety of game situations, in competitive events. Jumping is used in determining the level of fitness or motor ability. Jumping and falling correctly are classified as safety skills.

ELEMENTARY Children employ jumping skills in jumping rope, hopscotch, and other elementary play activities.

The standing and running broad jumps and the vertical jump are used in many tests of physical and motor ability.

Basketball and other team activities require players to be able to jump well.

The standing and running broad jumps, the high jump, and the pole vault are competitive in themselves and are included in track and field meets.

Falling or jumping from various heights, usually unintentionally, is a frequent cause of injury.

When distance is the goal, as in the standing and running broad jump, the body should remain in the air as long as possible.

JUNIOR The angle of take-off should be approximately 45 degrees in order to obtain the greatest distance.

It is necessary to practice projecting the body at the most effective angle on the take-off to achieve maximum distance.

Variations in body build, including length of the legs, necessitate adjustments in the angle of take-off.

To achieve distance on the standing broad jump, one must coordinate the action of the arms, trunk, and legs.

ELEMENTARY A wide base increases the stability of the starting position.

The feet should be placed slightly apart, but not further apart than the width of the hips, for the take-off.

The center of gravity must be brought over the edge of the base of support just prior to the take-off.

The depth of the crouch in the take-off position is related to the strength of the legs.

Jumpers should experiment to find the effective angle of the knees on the crouch.

Momentum of the arm swing, if properly timed, will increase the force and consequently the distance of the jump.

The jumper's body should be inclined slightly forward for the take-off.

The force exerted at take-off is all of the force available for achieving the distance desired.

The jumper should push off with the toes, following maximum extension of the legs.

At the instant of the landing, the legs must be bent to help carry the trunk and arms forward, since the measurement of a jump is always taken from the take-off to the part of the body which lands farthest back.

JUNIOR Several swings of the arms forward and back help to set a rhythm; the arms are swung as far back as possible before the forward swing and jump are initiated.

The extension of the legs is needed for power. The force from the legs is transferred through the toes and these forces are additive, providing maximum distance on a jump.

The pattern which jumpers should use for the legs is sudden extension on the take-off, followed by rapid flexion bringing the legs as close to the buttocks as possible, and subsequent extension forward. This procedure will carry the body well forward on the jump.

The center of gravity must be moved over the base just prior to landing, so that the upper body will move forward rather than remain behind the feet.

SENIOR The extension is followed by speedy flexion which permits the legs to swing under the body. The final reach in the jump is increased when the legs are extended forward.

A run prior to the jump will increase the distance of the jump.

ELEMENTARY In the running broad jump the body should be moving at top speed several steps before the take-off.

JUNIOR The run sets the body in motion, thus overcoming its inertia prior to the jump.

The direction of force in jumping for height is vertical, and all forces must be applied for an upward direction.

JUNIOR Force of the arm swing on a vertical jump must be directed upward, not forward.

More force is available for the jump if all major forces are applied simultaneously.

The height of the center of gravity is raised by adding a downward force to those forces which initiated the vertical jump, provided this downward force is exerted just prior to the time the body reaches its highest point in the jump.

In jumping for height, an advantage of several inches may mean the difference between success and failure in a game situation or test of jumping ability.

In the starting position for the basketball tip, or in rebounding, the arms should be held at the side with some flexion at the elbows. The feet should be separated, but not wider than the hips, for the take-off on a vertical jump. If a wider stance is used, some force is dissipated in the jump for height.

The push should be from both feet at the same time to achieve maximum height.

The vertical jumper should thrust one or both arms down as height is achieved, to add some height to the jump. (In tipping in on a basketball jump, the opposite arm should be thrust downward.)

In landing from a jump, proper techniques should be employed if the jumper is to be ready for the movement to follow.

ELEMENTARY Greater stability is achieved on landing if the base is widened in the direction of the forces.

Knees, ankles, and hips should bend on landing to increase the distance over which the shock is absorbed.

The more resilient the landing surface, the greater distance the body will travel on landing — a factor which reduces the shock of the landing. Jumping pits should be used when practical.

Falling is usually an unintentional landing; however, the skills of falling should be practiced.

ELEMENTARY The shock of a fall must be spread over the greatest area possible, in order to dissipate the force of the landing.

Patterns of falling which will minimize the effects of falling and reduce the likelihood of serious injury can be established.

1. The feet should be spread apart on falling, but not wider than the hips.
2. All joints of the lower extremities should be bent on landing.
3. Placing hands on the ground, followed by bending at the wrists and elbows, will absorb some shock on landing.
4. Rolling to spread the impact over a greater area on a fall may be accomplished by tucking the head and rolling, either in a forward roll or shoulder roll.

HOPPING

The hop is a basic skill pattern in which the body weight is shifted upward and forward from one foot, off the ground, to a landing on the same foot.

ELEMENTARY The amount of push or force needed for the hop depends on the distance and height desired.

The trunk is extended as the body is projected upward and forward.

Arms and opposite leg should be thrust upward to add force to the movement.

Taking the shock of landing gradually by bending the hips, knee, and ankle of the landing foot makes the landing from a hop easier.

Balance is maintained by locating the center of gravity over the supporting or hopping foot.

The arms should be used to help maintain balance, also.

Hopping is used in combination with other basic skills in numerous sport and dance activities.

Many elementary games and relays include the hop.

Dances incorporate the hop into the pattern of the dance steps (the polka, the schottische).

In some team sports, the hop is used in combination with other skills (positioning in tennis, lay-up shot in basketball).

LEAPING

In leaping, the body, after a take-off from one foot, moves through the air and lands on the opposite foot.

ELEMENTARY The push-off comes from the rear foot in the leap; the amount of force depends on the height and distance desired.

When the take-off surface for the leap is solid, the push must be down and back into the surface, in order to project the body forward and upward. The front leg is swung forward and upward to achieve height.

While the body is in the air on a leap, the front foot extends forward and the rear foot is raised high in back.

The trunk should be extended while the body is in the air to give an impression of grace and lightness.

JUNIOR The leap is used in dance activities, but variations and modifications of it are evident in some sports activities.

Hurdling may be considered similar to leaping, but clearing the hurdle is an added factor.

THROWING

There are three basic throwing patterns; overarm, sidearm, and underhand.

ELEMENTARY The overarm throw should be used when speed or distance are required.

More control can be exerted with the underhand throw because the arm moves in direction ball is to travel for a longer period before release.

The sidearm pattern is used more often in striking than in throwing; however, it is a good way to throw a large object.

Selection of type of throw used may depend on size, shape, and weight of object thrown.

Selection of throw used is also often imposed by the rules of a game.

JUNIOR The great body rotation possible in the overarm pattern, plus the sequential action of the several segments of the arm, make it suitable for achieving great speed and distance.

The underarm pattern is used more effectively when throwing an object of irregular shape or one which is cumbersome to grip or heavy.

The sidearm pattern should be used for speed and distance when the object cannot be grasped in one hand.

Certain preliminary motions may be added to the throw to increase the speed or distance.

ELEMENTARY The momentum of the body will be added to the throw if the body is placed in motion by stepping in the direction of the throw.

JUNIOR Taking several steps or several steps with a hop before the throw may add distance and speed, if proper timing is employed.

The body should rotate back to the right (for a right-handed throw) as the arm is brought back.

Greater force can be applied if a stride is taken in the direction in which the throw is to be made, because trunk rotation can be increased on the backswing.

In throwing for distance, the speed of the object at time of release and the angle of release will determine how far the object will travel.

ELEMENTARY The faster an object is moving at release (all other factors being equal), the farther it will go.

If an object is held in the fingertips, the lever will be longer, and flexion of the fingers at release will increase the speed.

The arm should be extended at the end of the backswing in the underhand and sidearm patterns.

Extension of the elbow should be followed by flexion of the wrist and, finally, flexion of the fingers.

JUNIOR The longer the lever, the greater the speed which can be developed.

An object should be moving as fast as possible at the moment of release. Therefore, it should be released before the arm and hand begin to slow down.

The greatest distance can be achieved when the angle of release approaches 45 degrees.

The thrower should experiment with angles to determine the best point of release for achieving distance.

Throws for distance are often required in tests of strength or general motor ability.

SENIOR The force built up at each joint will result in a summation of forces, if each force is applied when part below is moving at its fastest.

Varying weather conditions and varying weights of objects will affect throwing for distance.

ELEMENTARY Air resistance and wind flowing against the throw will reduce the distance.

The effect of wind and air resistance is different for objects of varying weight, size, and shape.

Light objects are usually more affected by wind than are heavy objects.

JUNIOR More force or power is needed to throw a heavy object than a light object; however, very light and fluffy objects may cover very little distance even though great force is used.

To reproduce or retest throws, all conditions of weather and equipment must be the same.

When a fast throw must be made, it may be necessary to sacrifice distance.

JUNIOR Many game situations call for speed rather than distance.

If the angle of release is less than 45 degrees, distance is reduced but the object will arrive at its destination faster.

If a throw is made in a straight line, it will reach its target sooner than if it is arched.

In throwing for accuracy, the overarm or underarm patterns provide the best results.

ELEMENTARY Accuracy, either by itself, or in conjunction with speed or distance, is the objective of many throws.

If the arc of movement is nearly a straight line, there are fewer possibilities for directional errors.

The direction of the object at the moment of release will determine the direction the object will travel.

More control can be exerted by the fingers than by another part of the hand.

Fingers should be directed toward the target at the moment of release.

Factors which influence the flight of an object after its release are wind direction and velocity, spin imparted to the object, and gravity.

ELEMENTARY Air resists the progress of the object.

An object will remain in the air longer if the wind is behind it, because the force of the wind is added to the force given the object.

When conditions are changeable, it may be necessary to make adjustments in throwing to achieve desired goals.

When throwing **into** the wind, one should decrease the angle of release.

When throwing **with** the wind, one should increase the angle of release, especially if distance is the objective.

JUNIOR/SENIOR If distance is the object, the thrower should impart backspin to the object.

An object will travel farther with backspin because it will remain in the air longer.

If a thrower's objective is to make a fast throw, he should put topspin on the object.

An object with topspin on it will fall to the ground sooner than it would without spin.

If more force is exerted on one side of an object than the other, the result will be a spin, curved arc of flight, and a different kind of rebound than normal.

ELEMENTARY If more force is exerted on one side of an object, it will curve toward the opposite side.

JUNIOR In some activities, a curve or different rebound is advantageous.

SENIOR A sidespin which causes a curved flight is the result of greater air resistance being built up on one side of the object, and lesser resistance on the side toward which the object curves.

The individual should learn to apply the force for imparting sidespin in keeping with his objective in the game situation involved.

An object with sidespin from right to left will rebound more to the left, and vice versa.

A ball with topspin will rebound higher than one with backspin.

STRIKING

Striking patterns are similar to throwing patterns, and the same principles apply to hitting and striking as to throwing.

ELEMENTARY Techniques employed in throwing as related to body rotation, angle of release, stance, speed and distance, and spin, are applicable to striking.

An infinite number of household and work tasks, as well as sports activities, call for hitting a stationary or moving object with some part of the body or an implement held by part of the body.

JUNIOR More speed and distance can be developed when striking than when throwing, other things being equal.

The longer lever produced by holding an implement with an extended body appendage makes it possible to build up more force.

When an implement is used to hit a moving object, the force of the implement must overcome the force of the object.

ELEMENTARY If the object's force is greater than that of the sum of the implement's forces, the direction of the object will not be reversed.

The movement of the striker's body is added to the force of the implement to increase the force of the hit.

The feet should be solidly in contact with the playing surface. They must push down and back in order to resist the force of impact and to apply forward force.

The striking surface must be firm, along with all body connections to it.

JUNIOR Wrists and arms must be firm at the moment of impact.

Some implements used in striking have a certain amount of "give." Adjustments in striking must be made to compensate for this.

The quality of follow-through affects power and direction imparted to the object being struck.

ELEMENTARY Although follow-through will not in itself change the flight of the object that has been thrown or struck, it assists in preventing error in judgment in coordinating movement and impact.

The follow-through in all striking activities prevents a reduction of speed before impact or release and a resultant loss of power.

The length and weight of the implement used in an activity determines the speed and distance a struck object can be made to travel.

ELEMENTARY The longer the lever, the greater the force possible at the end of that lever.

A long bat, racket, club, stick, arm, or leg has more potential force than a short object of the same kind.

A heavier implement has more potential force than a lightweight implement.

If the implement cannot be moved by the player with adequate velocity and control, however, lighter and smaller equipment should be used.

The composition and shape of the implement and the object will influence the speed and direction of the strike.

ELEMENTARY A soft object will "give" more than a hard object, so some force is lost and distance cannot be as great as when the object bounces away rapidly.

The curve or angle of an implement or an object will affect the direction in which the object travels.

SENIOR The rounded edge of a ball and curved part of a bat will affect the flight of the ball.

Stance at the time of impact will determine, to some extent, the direction of flight of an object after it has been struck.

JUNIOR Game strategy, in many activities, involves accurate placement of a struck object.

When an open stance is assumed (forward foot drawn back so that the trunk faces the path of the object), the object will tend to be pulled to travel parallel to a line drawn across the toes of the two feet.

When a closed stance is used (the forward foot advanced toward the target object), the object will tend to be pushed to travel parallel to a line drawn across the toes of the two feet.

The nature of the flight of a struck object may be partly determined by the position of the striking implement on the object itself.

ELEMENTARY The object will rebound at a 90 degree angle to the surface of the object applying the force.

JUNIOR When an object is struck in line with its center of gravity, it will travel straight forward, other factors being equal.

If the object is struck below its center of gravity, backspin will be imparted and it will rise during flight.

If the object is struck above its center of gravity, topspin will result and a more rapid drop in flight will occur.

JUNIOR/SENIOR The force will be most effective when imparted at a 90 degree angle to the striking surface of the implement.

Similarities exist between kicking and striking activities and, therefore, the same principles apply to both.

ELEMENTARY The kicker's objective is generally height, distance, accuracy, or all three.

When one wishes to give teammates time to get into position, height would be the objective.

Kicking for a goal or passing to a teammate requires accuracy.

JUNIOR Controlled distance kicking is the objective in many sports activities.

When a ball is to be kicked a great distance, adjustment for air resistance in relation to the force available must be made.

Distance will be reduced if the object is kicked into the wind.

The optimum angle of projection without air resistance is about 45 degrees. The kicker should kick the ball so that at the moment of contact the ball is projected at about a 45 degree angle with the ground.

If kicking with the wind, the angle would have to be reduced.

If kicking into the wind, the angle should approach 45 degrees.

Movement of successive parts of the body must be coordinated so that speed is transferred from one part of the body to another, and subsequently to the ball.

JUNIOR Practice is necessary in order to coordinate the forces supplied by each joint in executing a kick.

The speed of the ball is determined by the amount of force with which it is kicked, which in turn depends on the speed of the movement at each of the joints responsible for initiating the kick.

To attain accuracy, the angle of the kicking surface must be related to the target of the kick.

The kicking surface should strike the object at right angles to the intended path of the object.

In kicking any kind of ball, the movement of the knee joint should be added when the hip movement is at its fastest; the lower leg will therefore pick up movement of the upper leg plus that caused by the knee action, and it will move faster than the thigh. The same principle applies at the ankle, so that the greatest speed for the available force is developed at the point of contact.

CATCHING

Catching may involve catching an object or it may involve receiving impetus from another person or object. The kinetic energy of an object being caught is reduced by increasing the distance through which it travels after the impact.

ELEMENTARY Ability to catch a ball or other object or to assist another body in landing is important in many activities.

The body should be maneuvered to be in line with an object to be caught.

Hands will be in position for allowing recoil if the individual reaches out for the object to be caught.

Eyes should be focused on the object at all times.

Arms should be drawn toward the body as a catch is made.

The recoil of the arms will reduce the shock of impact by reducing the object's momentum gradually.

The weight should be transferred from the forward to the rear foot.

Shifting the weight to the back foot increases the distance of the recoil and further reduces shock.

Protective equipment reduces the shock of impact.

Adequate protective devices should be worn — glove, mitt, shin guards, etc.

JUNIOR Stability will be increased if the body is in line with the throw.

A large base of support provided by assuming a stride position in the direction of the object's momentum will increase stability.

Two problems in catching are rebound and injury to the hands or any other part of the body involved in the catch. Prevention of injury and reduction of apprehension about catching an object are primary concerns of the person catching an object.

ELEMENTARY Danger of injury to hands and fingers is reduced if proper procedures are used in catching.

Point the fingers either up or down to catch an object.

The palms of the hands and the flat (rather than the tips) of the fingers provide a larger area to receive the force of the object being caught; however, the fingers provide a more flexible surface for cushioning the force of the object.

Reduction of momentum of the object must be gradual in order to prevent injury and rebound.

The arms should bend as the object is caught.

Weight should be transferred to the rear foot in the forward-backward stride position, as the object is caught.

The movement which is to follow the catch is of primary importance in executing the catch.

ELEMENTARY The movement of the body during the catch should be in the direction of the preparation for the next throw.

The throwing arm may travel back beyond the body and become the backswing in preparation for the next throw.

JUNIOR If the size of the object permits, the arm which is to be used to make the subsequent throw should carry the object back after impact. This motion may also serve as the backswing for the next movement.

The throwing arm takes advantage of increasing the distance the object travels on impact, and this distance becomes the backswing for the throw.

If the direction of the next throw is 90 degrees to the right, the rear foot should pivot so that the toes are pointed in the intended direction.

In many game situations it is necessary to handle a ball which has first touched the ground. A bouncing ball is moving slowest when it reaches its highest point after the bounce.

ELEMENTARY Force of impact is absorbed somewhat by the ground.

A bouncing ball should be caught when it is at its highest point, to keep the force of impact at a minimum.

JUNIOR A player should take advantage of the fact that some force is dissipated on the bounce and stop or catch the object just after the bounce.

Up-and-down movement of the body should be kept to a minimum when the person catching is moving into position to allow him to make an accurate catch.

ELEMENTARY Failure to keep one's eyes on an object as the result of unnecessary up-and-down movement will cause failure to catch.

The arms should be moved in proper running fashion to prevent slowing down the run or unnecessary up-and-down movement.

Swimming is a skill which should be learned at an early age.

ELEMENTARY The increasing number of pools and swimming areas and the increased number of drownings amplify the importance of developing skill for survival in swimming.

A respect for the water can be appreciated when the learner is young.

Because it is more difficult to change incorrect performance than it is to develop skill in an activity, the important survival skills of swimming should be learned when one is young.

The ability to float depends on the relative positions of the center of gravity and the center of buoyancy.

ELEMENTARY Many individuals fear the water because they believe they are unable to stay afloat. Learning to float, both on front and back, is an important skill to learn.

The body tends to be overbalanced at the lower end because the center of buoyancy is more than halfway up toward the head.

When the center of gravity and center of buoyancy are the same, the body will float readily.

Adjustments should be made to bring the center of gravity close to the center of buoyancy.

Extending the arms overhead or bending the legs helps to bring the center of gravity closer to the center of buoyancy, counterbalancing the length of the lower extremities.

The air capacity of the lungs, in relation to the amount of bone, fat, and muscle in the body, determines the location of the center of buoyancy.

ELEMENTARY

A body submerged in a liquid is buoyed up by a force which is equal to the weight of the liquid displaced.

If the weight of the liquid displaced is equal to or greater than the weight of the body, the body will float.

The tendency of the legs to sink causes many beginners to have trouble in learning some strokes.

Lean individuals and muscular people must make adjustments in floating position in order to keep the head above water.

The location of fatty body tissue greatly influences the way in which the body floats.

JUNIOR

Expansion of the chest tends to increase buoyancy because of the increased volume of the lungs.

Since fat tissue has more volume than muscle, the obese individual tends to float easily.

The position for floating will vary with individuals; some float vertically, some horizontally, others float with legs and feet at an angle between these two positions.

SENIOR

Body volume in relation to the specific gravity of the body determines floating ability.

A person's inability to float may be due to an improper technique of getting into position.

JUNIOR

If a person who is not a horizontal floater kicks the legs up and tries to assume the horizontal position immediately, the body is apt to be overbalanced and the individual will sink.

Lying back in the water to place the body in a vertical float, then pushing gently to allow the legs to rise slowly, is the best method of approaching a horizontal float.

Swimming strokes are a combination of arm and leg movements which produce efficient and economical movement; however, forward progress is dependent upon the amount of resistance the body encounters in the water.

ELEMENTARY

The pull is achieved after the arms enter the water.

Hands should be cupped and fingers lead the movement of the arms.

When the body assumes a horizontal position in the water, less surface area is presented to resist forward motion.

Some beginners slow themselves down because of incorrect kicking techniques.

The most effective force in the kick occurs when the sole of the foot pushes back on the water during the upstroke of the legs in the flutter kick or when legs pull together, as in a frog kick.

JUNIOR

The most effective angle of pull is the arm entry at a 45 degree angle to the surface of the water and pulling through a range of 90 degrees.

All swimming strokes have three parts or phases: power, recovery, and glide, or rest.

ELEMENTARY The power phase provides the force to propel the body through the liquid.

The recovery phase enables the swimmer to get ready for the next stroke.

The glide phase varies according to the stroke and determines the strenuousness of the stroke.

The crawl strokes have the shortest glide or rest phase and therefore are very strenuous.

Overstroking may result in adding resistant surface at inopportune times. Improper recovery position or timing may reduce or counteract the effectiveness of the power phase.

JUNIOR The most effective angle at which to initiate the application of force is at a 45 degree angle to the desired direction.

The arms should be kept close to the body during recovery to reduce resistance.

When speed is important, the fit and material of the suit are considerations.

ELEMENTARY A bathing suit should fit well in order to avoid air pockets which tend to slow down progress.

Silk or slick material is less resistant to water than is wool.

Unnecessary up-and-down movements which are caused by moving the body, or part of it, too fast or improperly, may cause a swimmer to lose his effectiveness.

ELEMENTARY Force applied vertically will cause an up-and-down or rolling motion.

Starting the arm pull too soon or kicking vertically will tend to cause the body to rise in the water.

Lifting the head out of the water too far will cause undesirable agitation of the water.

Waves, eddies, and cavities which are created result in loss of speed or inability to progress through the water.

Sometimes, improper leg action will cause eddies, with a loss of speed.

SENIOR Moving too rapidly or improperly may create cavities or eddies and a loss of suction, which means that the force is apt to vary and cannot be applied in the proper direction for progress.

Tenseness caused by fear or anticipation tends to build up internal resistance, and progress is slowed down.

ELEMENTARY Ability to relax in the water is significant in learning to swim and in competition.

BODY MECHANICS

The six skills listed below, although usually included in any list of fundamental or basic skills, are more properly listed as fundamental body mechanics. When and if they are used in performing sports skills, they are usually modified or adapted to meet the special requirements of the sport. Therefore, we have separated these skills from those that are more commonly associated with the performance of activities. They are as follows:

1. Standing
2. Walking
3. Sitting
4. Stooping
5. Lifting and carrying
6. Pushing and pulling

STANDING

The type of standing posture demonstrated by an individual may be characteristic of his personality or it may be the result of nutrition, climate, training, or body structure.

ELEMENTARY Posture is an important factor in the impression one creates on others and in one's own feeling of well-being.

The person who wishes to create a favorable impression should have knowledge of and should practice good habits of posture.

The energy cost for standing is greater than that required for sitting or lying, and almost as great as that needed for walking.

JUNIOR The cost of standing is high because of the need to overcome the force of gravity to keep the body segments in alignment.

Force needed for maintaining alignment is derived from the contractions of antigravity muscles.

SENIOR So much of the working day is spent in an upright or partially upright position that an effort must be made to conserve energy in the standing position. Fatigue can be postponed by allowing the various muscles to relax intermittently.

The segments of the body (head, trunk, legs, and feet) should be properly aligned for efficient posture.

ELEMENTARY The awareness of position of body segments and the ability to maintain alignment are essential to efficient standing posture.

The more nearly the center of gravity of each segment is placed over the center of gravity of the segment below, the less effort needed for maintaining alignment.

The head should be well-balanced over the shoulders.

Shoulders should be level and relaxed with shoulder girdle balanced above the hips; shoulders should be pointed directly out to the sides, so that the shoulder blades are flat.

The pelvis should be in a balanced position over the legs.

Knees should be "easy"; i.e., not hyperextended.

Toes should be pointed straight ahead, weight balanced over both feet and evenly distributed between heels and balls of feet.

Points which should be used in determining good posture are the front of the ankle, front part of the knee, middle of the hip joint, tip of the shoulder, and slightly behind the tip of the ear.

JUNIOR Proper alignment of the body reduces pressure on the weight-bearing joints and decreases stress on muscles and ligaments.

SENIOR When segments are aligned, the moment of rotation about the joints is reduced.

Efficiency in standing requires stability. For stability in standing, the height of the center of gravity, the size of the base of support, and the location of the line of gravity are important considerations.

ELEMENTARY The lower the center of gravity, the greater the stability.

The larger the size of the base of support, the greater the stability.

The closer the center of gravity is located to the line of gravity, the more stable the body.

The center of gravity must be located within the base of support for stability.

The center of weight of each segment of the body must be situated over the segments below for stability to exist.

Since the foot extends forward and back, it is possible to keep the body weight over the base of support even when slightly changing one's body position.

In standing, the center of weight of the body is about at the height of the hips, halfway between the front and back.

The person standing with feet slightly apart will be more stable than the one who stands with feet together, or on tiptoe.

Raising the arms over the head elevates the center of gravity and decreases stability. Compensatory movements, such as widening the stance, should counterbalance the effect of raising the center of gravity.

Holding an object out to the side at arm's length moves the line of gravity away from the center of weight and decreases stability. Holding an object as close to the center of gravity as possible increases stability.

Gravity is always exerting a downward force on body segments.

JUNIOR The counterforce of antigravity muscles is responsibie for keeping the body erect.

In standing, there is rotation at all joints, because the centers of weight of all segments generally do not fall in a perfectly straight line.

The center of gravity passes in front of the knee and ankle joints, causing gravity to create a rotary force in the body.

When standing in a static position, the action and reaction of antagonist muscles cause the body to sway, as the extensor muscles of the trunk, hips, and legs work to prevent the collapse of the body.

External conditions which result in the carrying or supporting of weight require adjustments of alignments.

ELEMENTARY Changes or variations in one direction are counterbalanced by an adjustment in the opposite direction.

When an external load is carried in one arm, adjustments must be made by the other side of the body, in order to maintain a balanced position.

JUNIOR In standing in shoes with heels, the center of gravity must be adjusted backward.

WALKING

Walking is a form of locomotion in which the body is propelled by alternately losing and regaining stability by moving the legs alternately, aided by the force of gravity and the momentum of the body.

ELEMENTARY From a standing position, the walk is begun by leaning forward from the ankles to move the center of gravity in the intended direction of motion.

Gravity aids in overcoming the inertia of the body and force can be applied in the desired direction.

The force is supplied by pushing back and down with the toes of the rear foot as the ankle flexes.

The resisting surface "pushes back" to provide movement forward, off the supporting foot.

The free leg swings forward and the heel touches the surface slightly before the rest of the foot, so that there is a momentary period of double support which helps to maintain balance.

Each leg alternates between a swinging phase and a supporting phase, and one foot is always in contact with the surface.

The shock of landing is absorbed by bending the knee.

Once learned, walking is more or less automatic, but speed, stride, or position may be changed at will.

Growth, habits, self-consciousness, and health may influence one's walking pattern.

Walking is the most important basic movement skill.

Proper walking can minimize fatigue.

Walking in proper alignment can improve one's appearance.

The arms move in opposition to the legs.

Certain activities, such as carrying parcels, may change the rhythm of the arms, and adjustments in body action will compensate for the lack of arm swing.

If arms swing sideward away from the body, a hip sway will result which increases the effort needed for walking.

A lengthening of the stride will result in a greater up-and-down motion and extra rotation of the upper part of the body.

JUNIOR During the supporting phase, the body is propelled forward and the forward movement is resisted from the time the heel strikes the ground until the center of gravity is over the supporting foot.

The propelling force of one foot must exceed the resistive force of the other foot, for movement to result.

When walking up or down a slope or stairs, into a strong wind or on a slippery surface, adjustments in body position and technique must be made.

ELEMENTARY Care in walking in different situations will help prevent serious falls.

When walking up a slope or up stairs, the center of gravity must be moved up, as well as forward; thus, more force is required than for walking on the level. The push from the foot must be diagonally upward and forward.

When walking down a slope or down stairs, the center of gravity is kept back over the base of support by allowing the ball of the foot to touch before the heel is placed down.

When walking into a strong wind, the body is inclined forward to counteract the force of the wind. If the wind is coming from behind, the body should be held erect or inclined backward against the wind.

In walking on ice or other slippery surfaces the stride is shortened, in order to reduce the need for much backward thrust and to permit both feet to stay on the ground for a longer period of time.

When walking on a slippery surface, a shoe with a rough or rubber sole that will increase friction should be worn.

SITTING

In sitting, the upper trunk should be properly aligned, as in standing. In contrast to standing, the base of support in sitting is enlarged. The center of gravity is moving backward when one sits down.

ELEMENTARY

Much time is spent in sitting for work, for rest, for reading, talking, or performing many daily tasks.

The basic skill of sitting includes sitting down in and rising from various types of chairs and sitting down on and getting up from the floor.

Sitting down easily and gracefully requires control of the body weight as it moves back to assume a new position.

JUNIOR

Ease and grace in performing various movements including sitting are important for aesthetic reasons, as well as for efficiency of movement.

In order to sit properly, stand with the back to the chair. Place one foot ahead and one back as far as possible, either under or to the side of the chair.

Placing one foot ahead of the other to sit down widens the base of support and aids in balance.

The hips and knees must bend as one sits down. Knee extensors should control the movement.

Bending can control movements against the force of gravity.

The body is inclined slightly forward, as the hips are lowered to the edge of the chair. The hips should then be slid to the back of the chair.

As one sits, the body should be inclined forward from the hips only as much as is necessary to keep the center of gravity over the feet.

Rising from a chair is accomplished by reversing the procedure for sitting down.

JUNIOR Place one foot well back under or to the side of the chair.

Widening the base of support should eliminate the need for thrusting the body forward or using arms to lift the body when rising from a sitting position.

Slightly incline the body forward from the hips to transfer the weight over the forward foot, extend the legs, and rise.

Sitting on the floor presents additional problems because the distance through which the body must move to sit is greater than that for sitting in a chair.

ELEMENTARY Numerous occasions call for sitting on the floor. This skill is particularly significant in some dance activities.

Dropping to the knees from a standing position may result in serious injury to the knee joints.

The center of gravity must be kept over the base to control the weight.

Increasing the size of the base will aid in balance.

Body segments must be kept in alignment to provide stability.

The arms should be extended forward to aid in balance.

Leg muscles should be used to control the movement.

As the hips approach the floor, one hand should be placed on the floor to increase the size of the base and support the body while the legs are moved from under the body into sitting position.

Arising from the floor requires practice in order to accomplish the task efficiently and gracefully. The best method of the several that are acceptable will be governed by the individual's body build and weight distribution.

JUNIOR The center of gravity must be moved over a new base of support as one prepares to rise from a sitting position.

Weight may be shifted to one hip so that one leg can be placed under the body to allow the assumption of a kneeling position prior to standing.

One hand placed on the floor may be used as part of the base of support while one leg is moved under the body.

The forearm may be extended forward, and then swung downward to provide momentum for rising from the floor.

Legs should be extended to raise the body as the trunk is inclined forward slightly from the hips.

Special applications are necessary to specific work tasks and to sitting on different types of furniture.

JUNIOR Regardless of the type of chair used for sitting, the hips should be kept well back in the chair, with the lumbar region of the spine well supported.

Adjustments and frequent changes of position are important in preventing fatigue and circulatory malfunction.

Chairs should allow for some movement during prolonged sitting.

When one is seated, if the eyes must be brought closer to a work project, the trunk should be inclined from the hips.

In performing work tasks for prolonged periods in a sitting position while using the feet to do the work, as in operating a sewing machine with a foot pedal, an angle of about 165 degrees should be made at the knee.

For optimum work to be performed while sitting, the angle at the knee must be considered.

JUNIOR Compression of blood vessels and/or nerves results in a diminishing of blood supply to the legs, and discomfort results.

Pressure on the thighs should be avoided while sitting. Pressure generally occurs if the chair is too high for the person, or the seat is too long.

Undue pressure results in discomfort, numbness, poor circulation, and eventual pain.

Feet should be placed flat on the floor with some space under the thighs.

STOOPING

Stooping, or the lowering of the entire body, should be used whenever an object is to be lifted from or caught at ground level.

ELEMENTARY Although more energy is expended in stooping than in bending, the leg muscles take the strain, rather than the muscles of the back that are used if one bends only from the waist.

Stooping is a skill used in many activities (tag, ball games).

Increasing the size of the base will increase stability.

A stride position with feet slightly apart should be assumed before bending the legs and lowering the body.

If the trunk is inclined slightly forward, less energy is used than if the trunk is held in a vertical position.

By stooping and using the leg muscles when lifting, one may prevent injury to the back.

With the trunk inclined slightly forward, the body should be lowered by bending the hips or knees enough to place the hands under the object to be lifted.

Legs should be straightened to lift the object and the body to an upright position.

LIFTING AND CARRYING

There are several methods by which objects may be lifted and carried economically and safely. The manner selected depends upon the particular object and purpose to be achieved.

ELEMENTARY The size and shape of the object and the distance and location of the goal are factors which determine the method of lifting.

Improper lifting and carrying often lead to injury of back muscles.

The weight of the object to be lifted and/or carried by an individual should be tested using proper methods of lifting to see if the object can be lifted without undue strain. If it cannot, the task should not be attempted by one person.

SENIOR Females should be able to lift and carry safely approximately one-third of the body weight. Males should be able to lift and carry approximately one-half of the body weight.

The person should face the direction of intended movement before lifting an object which is to be carried.

ELEMENTARY Twisting or turning movements during lifting may lead to back injury.

JUNIOR Changing the direction of movement once the object has been lifted is costly, in terms of energy required.

Friction existing between the feet and the floor affects the task of lifting.

ELEMENTARY Unless sufficient friction exists between the floor and the feet, the proper mechanics of lifting cannot be used.

Shoes which have rubber soles and heels or a rough composition surface should be worn. If the floor is slippery, an abrasive substance should be applied where the feet will be placed.

Whenever possible a load should be divided so that one part may be carried on each side of the body.

ELEMENTARY The body may be kept in proper alignment if the weight carried is equally distributed on both sides of the body.

In carrying an object on one side of the body, the arm on the opposite side of the body should be extended to that side to counteract the weight.

Carry several items by dividing the weight evenly in each hand.

Objects stored on shelves that are above the head of the individual should be taken down with a minimum of stress on arms and back.

ELEMENTARY To minimize overreaching, the first step is to pull the object to the edge of the shelf. In lowering the object from a shelf, a broad base of support will provide greater stability. Advancing one foot helps to make a broader base so that the center of weight of the object can be kept close to the center of gravity of the body, and strain on the back can be lessened.

Place one foot as close as possible to the front line of the shelf, with the other foot well back. Arms and shoulders take much of the weight at first, but the weight should be borne by the legs at the moment the person assumes the full weight of the object.

PUSHING AND PULLING

In pushing or pulling, direction, speed, weight, and shape of the object are important factors in the kind of action needed to move the object.

ELEMENTARY Activities involving pushing and pulling occur in the performance of everyday work tasks.

Direction of a push or a pull depends upon the direction of force applied to the object.

Force should be applied near the center of weight of the object in order to move it in a straight line.

If one wishes to rotate the object, force must be applied off-center and as far from the center of weight as possible.

Speed in moving an object is best maintained if the object is kept in motion once it has started to move.

The weight of an object and the friction between object and surface are factors to be considered in determining the best way to move the object.

ELEMENTARY Friction between the mover's footwear and the supporting surface should be high so that force applied will be effective. Rubber-soled shoes can be worn to increase friction.

Placing paper or something slick under the object may help to reduce friction, making it easier to move the object.

JUNIOR It is often necessary for individuals to move heavy objects some distance on both smooth and rough surfaces.

Economy of effort and avoidance of strain are important in performing any moving operation.

Force must be applied below the center of gravity if friction is considerable.

When there is a great deal of friction between the object and the surface, the body should be kept low and the force applied needs to be increased substantially.

It is more efficient to push a heavy object than to pull it or carry it.

ELEMENTARY Knowledge of proper methods of pushing reduces the danger of injury.

Force must be applied in the direction of movement.

The force applied by the working muscles is transferred directly to the object.

If the size of the base is increased, stability of the body is increased and the force applied may be more effective.

The effective force will be increased if there is constant contact with the surface of the object and if the force applied is continuous once the object is in motion.

JUNIOR A forward-backward stride position of the feet is the most effective stance for pushing.

The body should be inclined from the ankles toward the object and in the direction of intended motion.

The strong leg muscles should supply the necessary force by alternately flexing and extending the ankles, knees, and hips.

The upper part of the body should be held firm and in alignment.

An object which has a very low center of weight and which is heavy may be pulled more effectively than pushed.

ELEMENTARY The lower the center of weight of the object, the lower the crouch must be in order to push in line with the object's center of weight.

It is easier to balance while facing forward, because of the range of movement of the feet and ankles.

Proper aligment of body segments results in safer, more effective movement.

Force should be supplied by the strongest muscles available for the task.

A rope or other material should be attached in line with the object's center of weight or below it.

The person pulling should stand facing the direction of the pull and in a stride position, with toes pointed straight ahead (for applying force back on the surface).

The trunk should be inclined forward from the ankles, and the knees should be bent so that power to perform the task may be supplied by extension of the legs.

There are some variations of pushing and pulling which involve the same basic principles of execution.

ELEMENTARY Since the direction of movement is vertical in opening a window, the body should be placed close to the window, arms and trunk straight, knees bent.

If the arms and trunk remain upright, straightening the legs will employ the strong leg muscles to supply the force needed.

To initiate the movement of an object on wheels, the principles of pushing or pulling apply. More effort is required to initiate motion (overcome inertia) than to maintain motion.

Once the object is in motion, it can be kept in motion by the steady application of less force than was necessary to start the object moving.

To stop the rolling object, a greater force must be expended, to overcome inertia. The force must be applied in a direction opposite to the movement. The same principles of mechanics apply.

CONCEPTS FUNDAMENTAL TO MOVEMENT SKILLS IN STRATEGIES AND ACTIVITY PATTERNS

All strategies and/or activity patterns are dependent upon efficient execution of basic skills.

ELEMENTARY Basic skills involve the ability to handle the body efficiently in space (balance, level, direction); in time (variations in speed); and with proper amounts of force (handling of body weight).

The performer who handles his body efficiently in a game or other activity has an advantage over a person who is less efficient.

The team that understands the relationship between defending and attacking players has a basis for developing effective team strategy.

Ability to perform well in gymnastic and dance activities is determined, in part, by skill in balancing the body in many positions, ability to change level and direction quickly, and ability to apply proper amounts of force for the desired quality of movement.

JUNIOR The student must understand the mechanics of basic skills, as well as work toward efficient performance of all movement.

The force of gravity acts upon every object, including the human body.

ELEMENTARY The force of gravity is exerted downward toward the center of the earth.

Understanding how the body must adjust to gravity is important in maintaining balance in a static position and in moving effectively.

Skill in adjusting to the force of gravity helps the performer handle his body safely.

Skill in adjusting to the force of gravity helps the performer gain an advantage over an opponent, if he can maneuver his own position to throw the opponent off balance.

JUNIOR This skill is used to advantage in such sports as tennis and badminton, where a quick shift of weight by a player may cause an opponent to lose his balance.

In team games such as basketball and soccer, where quick shifts of weight are important, team strategies may be planned around such skills.

The center of gravity of an object or human body is the center of its weight and the point around which it balances.

ELEMENTARY In the human body, the center of gravity is near the region of the hips.

Knowing where the center of gravity is located will help an individual in retaining or regaining his balance.

Students should learn where the center of balance is in their own bodies, as every individual's structure is different.

An object or human being is balanced when the center of gravity is directly over the base of support.

ELEMENTARY The weight must be centered on the supporting base.

If the body shifts so that the line of gravity falls outside the base, the center of gravity will move downward until a new base directly under the center of gravity is established.

The closer to the center of the base the line of gravity falls, the more stable the body will be.

Understanding how to maintain and regain balance is fundamental to moving safely and effectively.

A player can gain an advantage over an opponent by forcing him to move quickly, which may throw him off balance, because it is difficult to stop and keep the center of gravity over one's base.

Increasing the base of support improves stability.

ELEMENTARY By widening the base of support, there is less chance for the center of gravity to shift beyond the point where balance will be lost if any part of the body is moved.

Some activities require stability, and the ability to attain and regain stability may be basic to safety, as well as important to effective performance in gymnastics, dance, and sports.

In a headstand, for instance, placing the hands and head in a wide base is essential in order to maintain balance easily.

Enlarging the stride position allows for more stability in activities such as throwing, where force must be applied.

Landing or stopping in a stride position enables a player to regain balance quickly, thus placing him at an advantage because he is in a balanced position to begin his next movement.

In order to move through space, the body must be shifted from its stable position toward the direction in which it is to move.

ELEMENTARY In order to move in a given direction, the center of gravity must be moved outside the base of support, in the direction of the intended line of movement.

Skill in moving may prevent accidents in one's daily activities.

Skill in moving provides the basis for more effective participation in sports, dance, and gymnastics.

In trying to gain a movement advantage over an opponent, a player may use a feint, or pretend to move in one direction, in order to get his opponent to overshift in this direction and so lose his balance.

Lowering the center of gravity and leaning in the direction of a turn assists the individual in changing direction quickly.

ELEMENTARY If the line of gravity moves outside the base of support, instability results in the direction of the movement.

Quick changes of direction are needed in many games, in dance, in stunts and tumbling, and in diving.

Executing a dodge or making a quick shift of direction are movement skills that may be used to avoid or get around an opponent in running and tagging games, and in such sports as football, hockey, soccer, and basketball.

In order to maintain stability when there is movement or opposing force, the base should be enlarged in the direction of the force.

ELEMENTARY Stability in a given direction is in proportion to the horizontal distance from the center of gravity to the edge of the base toward which a given force is being applied, or in the direction of the anticipated movement.

Balance must be maintained to prevent falling and possible injury when there are outside forces affecting the individual.

When a moving vehicle lurches, a standing passenger can better maintain his balance by stepping into a stride position (feet wider apart or one foot ahead of the other).

In throwing, the forward-backward stride should be taken to permit the maximum throw.

This principle applies to two persons balancing one another in any direction.

Lowering the center of gravity, shifting it backward, and/or increasing the size of the base of support helps the performer to stop quickly.

ELEMENTARY Lowering the center of gravity is accomplished by "giving" with the knee of the forward leg.

Momentum is absorbed gradually and the center of gravity is shifted backward, thus re-establishing the stability of the body.

Stopping within a given distance and from various forms of movement is a skill required in almost all games, in various forms of dance, and in some gymnastic stunts.

JUNIOR Offensive and defensive strategies in running games require players to be able to stop quickly; for example, in attempting to cause an opponent to overrun while the player himself can stop, dodge, or change direction.

A side-stride stop is good to use when the forward momentum is not very great, and when a pivot is to be the next movement.

The height of the center of gravity is a factor in the difficulty of performance of some activities.

ELEMENTARY The higher the center of gravity, the more unstable the object. Thus, lowering the center of gravity increases the stability of the body.

Quickly lowering the center of gravity may prevent falling and possible injury.

An understanding of this principle and the skill to put it into effect in movement is an asset to the gymnast and player in maintaining balance, when the base of support cannot be shifted.

For instance, in changing direction on the balance beam, if the center of gravity is lowered, the body is more likely to remain balanced.

JUNIOR This principle is also applicable to dual tumbling stunts such as shoulder stands, where balance is difficult to maintain.

The eyes are an aid to maintaining balance.

ELEMENTARY The ability to use the eyes as an aid in balance is an important safety factor, as well as an aid to skill.

The eyes should be focused on some given point in the direction of the movement; as they locate a point of reference they help the individual maintain an understanding of where he is in space.

In turns, in dance, figure skating, and gymnastics, the eyes should be focused on the same object with each rotation.

JUNIOR In diving, the focus should be upward and outward rather than downward.

Rolling or twirling movements may cause the performer to feel continued motion, even after the body is still.

ELEMENTARY Ability to cope with temporary dizziness related to rotary motion is important as a safety factor.

Momentarily holding the head still during successive turns or twirls in a dance may minimize the feeling of dizziness.

Momentarily holding the head still in a series of rolls in gymnastics may help the performer in overcoming the feeling of motion.

JUNIOR The fluid in the inner ear is put in motion when the head is rotated in such activities as rolling and twirling.

Inertia causes this motion to continue after the body has stopped moving.

Recognizing the part the ear plays in rotary motion may assist a performer in overcoming temporary dizziness by adjustment of the head position at certain points in the activity.

In self-movement or the moving of an object, two of the factors that must be considered are the amount or magnitude and the duration of the force that must be applied.

ELEMENTARY Movement is produced only if enough force is applied to overcome inertia.

Quick dodges or changes of direction in evading an opponent may require added force, in order to produce a burst of speed in the direction desired.

JUNIOR In rotary movement, enough force must be produced to overcome centrifugal force.

It is important to recognize variations in force, because of the different amounts required to perform particular activities in a skillful manner.

In gymnastic activities involving rolls or handsprings, force against a solid surface (floor) is needed, in order to produce enough speed of movement to perform the activity.

Change of speed is an important factor in producing force in many activities.

ELEMENTARY Quick dodges or changes of direction in evading an opponent may require added force, in order to produce a burst of speed in the desired direction.

In passing a ball or in shooting for a goal, speed may be the controlling factor as to whether or not the ball will be intercepted by an opponent.

JUNIOR The faster the contraction of the muscles, the more force can be produced. The more force produced, the greater the possible speed.

This principle is important in running and jumping patterns such as those used in throwing to a high target or jumping on a reach (basketball).

The ability to apply force in changing direction, dodging, feinting, and other game strategies, can be improved by knowing the right amount of speed of muscular contraction necessary to produce the desired movement.

Less muscular effort is required to maintain a movement after it has been started and momentum takes over.

ELEMENTARY The more a performer can conserve his energy in those aspects of the activity which permit this, the more energy he will have when it is essential for all-out performance.

In advancing a ball while running, the player who can dodge or evade an opponent, or pass on the run, has a movement advantage over one who must slow down or stop in order to perform these activities.

In all games, a player must "keep on his toes" and be ready to run or move in any direction. The player is actually moving muscularly, because his muscles are contracted and ready for action, and they will not have to overcome the inertia of relaxation.

JUNIOR The force of momentum makes it easier to maintain a speed than to change it, once a movement has been started.

A runner is propelled forward with a force equal and opposite to that with which he pushes backward against the ground, provided there is sufficient friction and resistance to prevent slipping.

ELEMENTARY In games and sports, the correct amount of force might mean the difference between a quick getaway and a slow and ineffective defense.

JUNIOR For every action force, there is an equal and opposite reaction force.

When a body pushes or moves against a supporting surface, such as the ground, there is an opposite force exerted by the object against which the body is pushing.

The amount of relative force on takeoff is important to the correct and safe execution of the performance.

Muscular strength and kinesthetic awareness must be adequately developed before a performer can be successful in activities in the air where his body is unsupported.

Quick and strong bursts of movement in game situations in which dodging and sudden stops and starts are important require skill and an understanding of the exact force needed.

Direction of the application of force is a factor in effective movement.

JUNIOR It is important to know how to apply force in moving the body in various directions because economy of movement and safety are dependent on control of direction as the body moves through space.

SENIOR By applying force directly through the center of gravity, less force will have to be applied to make an object move in a linear direction.

The farther from the center of gravity the force is applied, the greater is the tendency of the object to tip or rotate. If for some reason the player wished to produce a curved or rotary movement, he would apply force outside the center of gravity, as in the striking of a baseball or the stroking of a tennis ball.

In applying maximum force, it is desirable to have all the body parts working which can contribute to the movement. Conversely, muscles which do not contribute to the movement should be relaxed.

ELEMENTARY This principle is important in the conservation of energy.

JUNIOR Almost all games and gymnastics require strength for skillful performance, and knowing how to conserve one's strength effectively may mean the difference between winning and losing a game or meet.

SENIOR A good player will attempt to conserve his own energy through the proper use of muscular effort and at the same time will attempt to get his opponent to use more effort in defending his particular position.

Keeping the arms close to the body in twists and turns permits faster rotation. Conversely, spreading the arms will help slow down the rotation.

JUNIOR Rotary velocity is dependent upon the length of the radius of the arc of performance.

The longer the radius, the less the rotary speed; the shorter the radius, the greater the speed.

This is an important factor to be considered in skills involving speedy twists and turns. In tumbling, diving, and trampolining, the performer in a tucked position rotates more rapidly than one in a layout position. Skaters and dancers are bound by this principle, also.

A performer can exert maximum force only if the surface against which he is pushing provides enough friction to keep him from slipping.

ELEMENTARY The amount of friction is dependent on the type of surface plus the downward force (weight).

The performer must take into consideration the surface on which he is working, in order to move safely.

Friction is most important in activities requiring a diagonally forward and upward movement, for it enables the performer to exert maximum force without slipping.

If a surface does not provide enough friction for a safe performance, the performer may need added or different equipment, such as special footwear.

JUNIOR A performer may wish to reduce friction for some kinds of activity (the use of special waxes on skis, for example).

Air resistance is an important factor in modifying motion.

ELEMENTARY Air resistance may assist in keeping a body in motion (as in a sailboat, plane, kite, or arrow in motion).

Air resistance may hinder a body in motion (as, for example, a light ball that meets a headwind or a badminton bird that encounters wind of any velocity).

Recognizing the possibilities of the effects of air resistance might help a player to determine the adjustments necessary for intended placement of his hit or shot.

JUNIOR In a game such as baseball, advantage may be taken of wind direction by directing the hit so that it will be carried further by the wind.

Water resistance is a factor in modifying the movement of an object through or on the water.

JUNIOR Backward force against the water sends an object forward.

The greater the surface pushing against the water, the greater this force will be.

Understanding the effect of water resistance is important to the swimmer and to the paddler or rower.

A rower or swimmer who is competing in a race will aim to reduce the water resistance to a minimum.

The angle of rebound of a ball may be controlled.

ELEMENTARY A ball will rebound from a surface at the same angle it hit the surface, provided there is no spin on the ball, the surface is smooth, and the ball is elastic.

Knowing the angle at which a ball can be expected to rebound is important in team games using a bounce pass.

A player who uses a bounce pass must make correct judgments on the angle at which to bounce the ball so that it can be easily caught by his teammate.

Correct judgments on the rebound of a ball must be made by a player who plans a bounce pass in order to avoid an opponent, so that the opponent will not be able to intercept the pass.

JUNIOR Knowing the angle at which a ball can be expected to rebound is basic to strategies in such games as tennis, handball, and paddleball.

In tennis, handball, paddleball, and similar games, the offensive player should plan the angle of rebound, so that his opponent will not be able to return a shot easily.

Spin on a ball will change the angle of rebound.

JUNIOR The ability to put spin on a ball gives a player an advantage in many games and is basic to deceiving an opponent who is attempting to play the ball.

Players in all games involving the return of a ball to an opponent should become proficient in putting spin on the ball.

SENIOR Topspin (forward spin) tends to make the ball drop faster; the angle of rebound is lower, and the ball will roll farther than a ball without spin.

Backspin tends to cause the ball to drop more slowly; the angle of rebound is higher, and the ball will roll a shorter distance than a ball without spin.

There will be a curve and bounce to the right if spin is put on the ball in a clockwise direction. It will curve and bounce to the left if spin is put on the ball in a counterclockwise direction.

Any body part that is completely stretched achieves the greatest dimensions possible.

ELEMENTARY A stretch involves extending fully one or more parts of the body in any direction on a vertical or horizontal plane.

The person who is limited in his capacity to stretch is limited in many aspects of movement, including the skills fundamental to games and sports, gymnastics, and dance.

The ability to handle the body in a stretched position is involved in such skills as catching, tagging, volleying, goal shooting, etc.

Kicking a football for distance requires practice in complete stretch of the leg.

In gymnastic stunts such as cartwheels, headstands, etc., the performer should work for extension of the entire body.

A bend is a flexion and contraction of one or more parts of the body. The movement is toward the body.

ELEMENTARY

The ability to bend depends on the strength of the contracting or flexing muscles, and the ability of the opposing muscles to stretch.

Bending occurs in many activities such as batting, catching, chinning, kicking, shooting for baskets, dodging, gymnastic rolls, and similar stunts.

The person who is unable to bend is limited in many aspects of movement, and in skills fundamental to sports.

The person who wishes to keep flexible should use bending exercises involving every part of his body. Flexibility is improved by slow prolonged stretching.

A twist involves rotating the body around its long axis or a part of the body around its own axis.

ELEMENTARY

Twisting is often accompanied by some bending and/or stretching.

Twisting requires flexibility, particularly when the body is rotated around its long axis.

The person who is able to twist his body at will has a valuable safety skill.

In the event of an accidental fall, the body can be twisted to take the impact on parts of the trunk.

A twist is part of movements such as batting, diving, throwing, and striking.

Many dance skills and gymnastic activities require the ability to twist the body or a part of the body.

In a dodge, the body position or parts of the body are shifted quickly in order to avoid a moving object or person.

ELEMENTARY

The dodge requires agility and quick reaction time.

Skill in twisting, bending, and stretching may also be involved.

The person who possesses dodging skills has an advantage in many game situations where evading an opponent is a strategy.

Dodging is also important as a safety skill in one's daily activities where hazards must be quickly evaded.

The dodge is basic to offensive and defensive team play in such games as soccer, hockey, football, and basketball.

Games require dodging an object such as a ball, as well as an opponent.

JUNIOR

The dodge involves the principles of balance, force, and change of direction.

Change of direction, including a pivot, involves agility, force, and an understanding of the use of space.

ELEMENTARY

To change direction from a walk, rotate the body on the ball of the foot which is opposite the direction of the turn, and step in the desired direction.

To change direction while maintaining contact with the floor with one foot (a pivot), the weight is kept over the foot in contact with the floor, as one or more steps are taken with the opposite foot in a circular direction. The force comes from the moving foot.

To be able to change directions quickly will assist in skillfully performing various physical education activities.

Precise changes of direction are used in floor work in gymnastics, in marching tactics, and in dance.

JUNIOR A pivot is used as a dodging tactic in basketball, speedball, and similar games.

A vault usually involves getting over an obstacle by bearing the weight on the hands only.

ELEMENTARY Vaulting fences and other obstacles has always been a challenge to children and adults.

In a vault, running to the obstacle is followed by a jumping take-off on one or both feet.

Simultaneously, or immediately following the take-off, the hands receive the body weight as the body is propelled over the obstacle.

Skill in vaulting is essential in gymnastics and athletic activities.

In falling, equilibrium is lost and the body is out of control.

ELEMENTARY Falls are hazards in walking and running when the feet trip over an object or the body is thrown off balance by an outside force over which the individual has no control. Practice in falling correctly may help minimize injury.

In falling downward from a height, the same skills are used as in landing from a jump—the weight is taken on the balls of the feet, and then the ankles, knees, and hips bend in quick succession.

The shock of a fall from a considerable height may be lessened by widening the base — placing the hands on the ground, "giving" with the wrists and elbows, and tucking the body to go into a roll.

In a fall in which there is a great deal of momentum forward, the individual should relax as completely as possible, tuck, and roll.

In a backward fall, the weight should be caught by the hands, arms, and buttocks, curling into a roll.

To prevent or minimize injury in a fall, an attempt should be made to reduce momentum gradually, increase the area of the body receiving the impact, and, if possible, land on the more padded areas of the body.

Many gymnastic activities and some sports activities place the body in unbalanced positions, and falls may result. The danger of injury may be minimized by practicing falls from various positions.

Falls are deliberately used in some aspects of dance and have become part of the learning of dance techniques.

Persons with skill in handling their bodies in a fall have a safety advantage that is important in games, gymnastics, and general body control in daily activities.

A dance walk differs from a natural walk in that it is smooth and gliding.

ELEMENTARY In a dance walk, the toes lead, and the balls of the feet slide along the floor, producing a gliding movement.

As dance floors are smooth, there is a reduction of friction, and the dance step is necessarily short, in order to prevent slipping.

The dance walk is important as a basic skill in various dance forms.

A dance walk allows for a quick change of force and direction.

Variations in the dance walk or any dance step may be used to portray different ideas and meanings in dance composition.

A skip is a combination of a walk and a hop in an uneven rhythm.

ELEMENTARY In a skip, the walk is followed by the hopping take-off into the air from the same foot. The free foot then steps forward into the walk for the second skip, etc.

The rhythm in a natural skip is "short-long" with the hop longer than the walk.

Skips may be done high in the air or they may cover more floor space, depending on the length of the step (walk) and where the person lands from the hop.

The rhythm may be changed if the dancer wishes to create a different effect.

In a dance, a skip is often used to create a feeling of joy or strength.

A gallop is a combination of a long step and a short step performed in a forward direction in a step-together floor pattern.

ELEMENTARY The long step is the take-off for the short step which lifts the body into the air. The same foot continues to lead. The rear foot lands in the spot left by the leading foot.

The rhythm is generally a 1:2 ratio of walk to run.

The gallop may be performed high in the air, or the steps may be elongated to cover more floor space.

The rhythm may vary with the length of steps, but it is always uneven.

The gallop and its variations are often used in creative dance to convey expressions of strength, exuberance, and speed. It is the basic step in many folk dances.

A slide is a combination of a long step and a short step performed in a sideward direction.

ELEMENTARY The analysis for the slide is similar to that for the gallop, except that the direction is sideward.

The person who understands and has mastered the slide has an important skill that can be used in dance, gymnastics, and sports activities.

The slide is used in the maneuvering that is important in games strategies such as the feint and dodging in basketball, and fast changes of direction in tennis.

The center of gravity is lowered to achieve better balance in sliding.

A step-hop is a walk and a hop done in an even rhythm.

ELEMENTARY In a step-hop, the walk or step is accented and is the take-off for the hop, which is done in place. The free foot may be bent under the body. The even rhythm may be fast or slow. If, on the hop, the free leg is swung forward or backward, adjustments in body position must be made to maintain balance.

It is important to know the step-hop, as it is one of the fundamental skills used in all forms of dance and rhythmic games.

The step-hop is used to create the impression of vigor and elevation in creative dance.

A schottische is a combination of three walking or running steps followed by a hop done in an even rhythm.

ELEMENTARY The schottische is performed in 4/4 time with the accent on the first of the three running steps. The pattern is "run, run, run, hop."

Folk, square, and social dances using the schottische step may be used in many recreational situations where active group participation is desired.

The schottische may be used in creative dance forms to achieve a folk dance quality or idea.

A two-step is a series of three walking steps done in a step-together-step pattern.

ELEMENTARY The three steps of the two-step are done in an even four-beat meter. If the left foot leads, the left foot moves forward, the right foot is brought up to the left, the left steps forward, and the fourth count is held.

The two-step is used in many folk, square, and social dances.

The two-step may be used in creative dance forms to achieve a folk quality or idea.

The polka is a combination of a hop and a gallop or a hop and a two-step.

ELEMENTARY In a polka, the hop precedes the slide or two-step, and lifts the body. The accent is on the first walking step. The pattern of the entire step in "hop, step, together, step."

The person who can perform these elements skillfully has the basis needed to participate in dance forms using the polka.

The polka may be used in creative dance forms to achieve a folk dance quality or idea and is used in many folk, square, and round dances.

The waltz is a combination of three walking steps done in an even three-beat meter.

JUNIOR In a waltz, the accent is on the first step, which is usually a long step in any direction. The second step is taken in an open position away from the leading foot. The first foot is then brought up to the second foot in a closed position.

Because the waltz has been popular as a social dance for many generations, it is important for the individual who is interested in dance to know how to perform the step.

The waltz may be used in folk, square, and social dances.

The waltz is used also in creative dance forms to achieve a specific idea or quality of movement.

The mazurka is a series of two walking steps and a hop, done in a uneven rhythm.

JUNIOR The mazurka begins with a step forward on one foot.

The other foot is then brought up to the leading foot and the hop is taken on this following foot, providing the impetus for a repetition of the entire step in the same direction.

The step is done in a 3/4 meter.

The mazurka is a part of many folk dances and may also be used in creative dance forms to achieve a folk dance quality or idea.

OFFENSIVE AND DEFENSIVE STRATEGIES

Successful team play requires the combined efforts of individuals.

ELEMENTARY A game may be won because of the cooperative play of mediocre players as opposed to the team where individual stars dominate the play.

Strategies in team play are often applicable to several different games, and their application may be carried over from one game to another.

JUNIOR Team play involves both offensive and defensive strategies planned to meet specific game situations.

Learning position play is essential to team play.

ELEMENTARY Every position requires specific skills and understandings.

It is important to play one's position correctly so that all players may know what to expect of every other player.

In addition to learning to play his own position, each player needs to know the general requirements for every other position.

A fundamental principle of offensive play is to advance the game object toward the goal.

ELEMENTARY A team that does not score goals does not win the game. This principle applies to all team games.

The game object is advanced toward the goal by the player either playing the object or passing it to teammates who are also advancing toward the goal.

Passing skills and strategies are essential to advancing the game object.

ELEMENTARY Passing skills and strategies include the following:

- Move away from a teammate who has the game object, but remain close enough to receive a pass.
- In receiving the game object on a pass, face in the direction of the goal which you are attacking.
- Pass ahead of a teammate who is advancing to an open space.

Players without passing skills and a knowledge of passing strategies may be the cause of their team's losing.

Some obvious illustrations of passing are the forward pass in football, and diagonal pass in soccer and hockey.

A fundamental principle of offensive strategy is to create spaces or openings through which teammates may move or objects may be propelled.

JUNIOR Spaces among one's opponents are created by drawing these players away from the spaces they should be covering by doing the following:

- Having some players act as decoys to create openings for teammates.
- Preventing defenders from closing openings that have been created.

It is important to create spaces because the attacking team can only advance the game object toward the goal if spaces have been opened up.

This principle applies in football, when players are drawn out of position on a forward pass play.

A fundamental principle of offensive strategy is to be aware of the weaknesses of one's own team and to protect these weaknesses.

JUNIOR Weaknesses are detected through analysis of patterns of play which are consistently ineffective.

Weaknesses of individual players are detected when team strategies are not successful because of the inability of any of the team members to carry out their assignments.

It is important to protect one's own weaknesses because the opponent will be making every effort to discover these and take advantage of them.

Weaknesses of individual players may be protected by attempting to prevent the opponents from using strategies which will show up these weaknesses.

Changing combinations of players may minimize the effects of weaknesses.

A fundamental principle of offensive strategy is to detect the opponents' weaknesses and strengths and play to their weaknesses.

JUNIOR Weaknesses are detected in the opponents' play through observation and analysis of patterns of play that are consistently ineffective.

Weaknesses of individual players that contribute to the weaknesses of the team strategies should be noted and played upon.

When individual or team weaknesses have been detected, the opposing team should attempt to revise its own plays to take advantage of these weaknesses.

By playing to the opponents' weaknesses and avoiding their strengths, the offensive team is using an important advantage in both offensive and defensive play.

A fundamental principle of offensive strategy is to attempt to cause one's own individual opponent to make an error that will enable a teammate to be successful.

ELEMENTARY The skills of feinting, dodging, and faking should be used to cause the opponent to make errors of judgment in timing and speed.

JUNIOR Errors in timing, tackling, and passing may be used to advantage by the opponent.

A player trying to advance the game object must rely on his teammates to assist him by preventing the opponent from being successful.

Plays should be devised that will cause the opponent to make errors, such as being drawn out of position.

A fundamental principle of offensive strategy is to vary the attack.

ELEMENTARY The attack may be varied by the use of different sequences of plays.

The attack may be varied by changing the responsibilities of specific players in the same play.

The attack may be varied by slight but definite changes in play; this catches the opponent off guard.

By varying the attack, the offensive team prevents the opponents from organizing their defensive strategy.

There is a better chance of scoring if the number of players involved in the offensive scoring play is greater than the defending players in the play.

ELEMENTARY Offensive players must maneuver their positions in order to bring an extra offensive player into the scoring area.

An extra offensive player in the scoring area means that one offensive player is unguarded and so has an advantage in his attempts to score.

A player trying to evade an opponent must attempt to gain a movement advantage.

ELEMENTARY A player may gain a movement advantage over an opponent in one of the following ways:

- Start more quickly than his opponent and thereby throw him off balance.
- Stop more quickly than his opponent and thereby throw him off balance.
- Cause his opponent to begin to move before he does (feint).
- Cause his opponent to move a greater distance than he does (overshift).
- Cause his opponent to jump or rise (overshift in the vertical plane).
- Stop more quickly than his opponent, causing him to over-run.
- Change direction suddenly, causing his opponent to over-run or overshift.
- Change pace, attempting to confuse his opponent.

It is important to have the movement advantage over an opponent because it keeps the opponent on the defensive. By gaining a movement advantage, the player is able to take the initiative or make the next offensive move, thus leaving his opponent to follow rather than to prevent a play.

All of the methods of gaining a movement advantage are, in part, dependent upon the skill of the individual player using his body efficiently. Therefore, players should work on and apply these skills in such activities as dodging, stopping, starting, and controlling direction.

A defending player should try to prevent an opponent from gaining a movement advantage.

ELEMENTARY Be flexible and ready to move in any direction.

A player who can prevent his opponent from gaining a movement advantage restrains his opponent's offensive play.

JUNIOR To prevent a player from gaining a movement advantage, allow spaces in which to maneuver and/or recover.

A fundamental principle of defensive strategy is to close spaces or openings through which opponents may move or objects may be propelled.

ELEMENTARY When a player must protect a certain area or space, his basic or "home" position is midway between the extremes to which he may have to go.

Beginning players have a tendency to follow the ball or game object; this often causes "bunching" of players and leaves large spaces uncovered or unguarded and should be overcome.

There should be awareness of openings, stressing playing one's own position.

JUNIOR Interchange of positions with a teammate when drawn out of position helps to close spaces.

It is important to close spaces or openings because the defense's main responsibility is to keep the opponent from moving the game object through such openings.

Players should practice interchange of positions with a teammate to provide for the eventuality of being drawn out of position and leaving spaces open.

A fundamental principle of guarding (defensive play) is to play the angle that allows the guard or defending player to intercept the game object.

JUNIOR The closer a defender plays to an opponent or a goal, the narrower the margin of error he allows himself, and the greater the advantage to the opponent.

The closer the defending player plays to the apex of the angle of a successful goal shot, the greater the chance of preventing a goal.

In order to illustrate the advantage of proper positioning in defense play, players should set up situations in which they may practice intercepting a ball or other game object from angles of varying degree.

Goalkeepers should come out from the goal to attack an oncoming offensive player if that player is ahead of his own teammates. This will force the offensive player to shoot for goal at a point that is easy for the defense to cover.

The best team defense is based on angles and diagonals that allow for emergency or alternate assignments by teammates.

SENIOR The principle is basic to zone defense and so is important to anyone who will be playing on a team where team strategies are based on zone defense.

Such games as football and soccer use zone defense as a primary means of defensive strategy. This strategy may also be effective in basketball, field hockey, speedball, etc.

The defensive player should stay between the offensive player and the goal.

JUNIOR If the defensive player fails to keep his position between the offensive player and the goal, it follows that the offensive player has free access to the goal.

If a defensive player finds himself in a position where the opponent has passed him on the way to the goal, the defensive player must try to regain the desired position with added effort and speed of recovery.

A teammate may have to assume the position of the defensive player who has been passed up, with that player taking the position of the teammate.

RULES AND PROCEDURES

OFFICIAL RULES

Many different governing bodies are concerned with providing rules for local, state, national, and international groups of men and women who participate in various sports.

ELEMENTARY Group action in making rules is as basic in competitive sports as it is in a democratic society.

All rulemaking groups are interested in the health, welfare, and safety of the players and spectators as well as in the proper conduct of the game.

Adult groups are responsible for making the rules for organized or official games for children.

Governing groups adapt the rules to the needs of players at various ages and skill levels.

City groups or school representatives make rules for the conduct of games in large urban areas or leagues.

JUNIOR The rulemaking groups generally consist of coaches and former players who are especially knowledgeable about playing problems and conditions.

Authority is given to these groups by the process of appointment and/or election to the rulemaking bodies.

County, state, and national groups make rules for groups, leagues, or conferences in their geographic regions

Some governing groups are concerned with interstate play; others with international contests.

International competition, including Olympic competition, is controlled by international groups that decide on rules to govern the contests.

Official rules are reviewed each year by each governing body, and changes are made in rules or wording of rules that are needed to improve the game.

ELEMENTARY Official rules, whether or not players and coaches consider them to be good rules, are binding on all groups that have agreed to accept them, and must be followed until the rules are changed or modified.

JUNIOR Consistency of rule interpretation and application are essential for uniform conduct of the game, to prevent misunderstandings or disagreements, and to protect the welfare of the players.

Suggestions for improvement or clarification are solicited from officials and coaches and are discussed by the rules body before action is taken.

Some rules changes are subjected to experimentation for a period of time to determine whether they should become official changes.

As play improves and players become more skilled, rules are refined to make the game more demanding.

Official rules books are available for each sport. Some may be purchased, others are provided as a service by companies that manufacture sports equipment.

Players, coaches, and officials should have the current rules book.

SENIOR Reports are made by officials and coaches as to problems of interpretation, including differences of opinion among officials and questions raised by players and spectators.

Players or coaches who question or disagree with rules or rules changes should inform the official rules interpreter, who will convey the objections to the rules committee.

Official rules include regulations for equipment and may provide procedures and techniques of officiating.

ELEMENTARY Rules and regulations apply equally to each player and to each team.

Because officials must be impartial, governing groups try to develop rules which are precise enough to be easy to apply objectively and impartially.

Sometimes, differences in rules interpretations necessitate the clarification and often the change of a rule.

JUNIOR Rules requiring judgment are the most difficult to interpret and to apply.

Regulations on equipment are necessary to keep individuals and groups from taking advantage of the game through new equipment and materials that might be of unfair advantage to one group.

SENIOR Governing groups conduct conferences for explaining rules and for discussion of rules changes.

Changes are necessary because of new equipment, due to research in materials, and new information about the effects of stress and human contact.

Officials should accept evaluations or criticism made by others and try to improve shortcomings.

Officials must keep licenses current and should wear appropriate clothing or the official uniform.

LOCAL AND HOME RULES

If official rules are modified or changed to solve problems unique to a specific situation, they are called "local rules."

ELEMENTARY

Local rules must be mutually accepted by those who play the game, and should apply equally to all players and to each team.

Participants should know the local rules, in order to play the game well within the rules and to enjoy the play.

JUNIOR

When local rules are used in an official game, the designated official or referee should interpret all rules and solve any conflicts in rule interpretation.

When a problem arises in a game played by official rules, the official makes a decision; later the rulemaking group may meet, reach a mutual agreement, and modify the official rule to meet local situations.

In some playground, recreation, and after-school games it is not possible to use official or local rules. Rules adapted to such situations are known as playground or home rules.

ELEMENTARY

The number of available players, size of the field, varieties of equipment, skill of players, and/or safety conditions may require the modification of official or local rules for recreational use.

Conflicts and disagreements may be resolved by stopping the game until an agreement is reached by mutual understanding.

Teachers, supervisors, and/or players themselves develop rules for special situations to protect the health and safety of all concerned.

OFFICIALS AND LEADERS

Teachers, coaches, and officials are leaders whose directions should be respected and followed.

ELEMENTARY

Leaders are appointed or elected on the basis of training, knowledge, experience, and understanding of the game.

Leaders are expected to be fair, impartial, and to have the best interests of the group in mind.

Leaders are necessary for implementing the rules and procedures set by governing groups.

JUNIOR

Leaders should know current rules, procedures, regulations, equipment changes, techniques, and strategies of play.

Qualifications for leadership roles vary in different groups and for different situations.

Participants are obligated to follow the directions of those who have been chosen or appointed as leaders. An arbitrator may be necessary for the control of competitive activities. Officials are appointed or elected as impartial arbitrators for formal or scheduled competitive events.

ELEMENTARY

Many decisions are judgment situations and may not be decided or called as participants would like, but they should be accepted as the best efforts of a human being at that precise moment.

Officials' decisions should be accepted even though officials sometimes make mistakes in judgment.

A participant should be able to question the decision of an arbitrator or official if he does not understand it, but he should not complain or argue the decision and should be able to discipline himself to follow the directions.

Each governing group sets up procedures for the training and selection of officials.

JUNIOR To be certified, officials must demonstrate knowledge and interpretation of rules as well as officiating procedures.

SENIOR Certified officials are registered and are usually scheduled well in advance of a contest.

Officials are often evaluated by other officials and coaches, and sometimes by players.

Rules and regulations are made for the benefit of the majority.

ELEMENTARY A person must not break rules or fail to abide by them simply because they are not liked by the individual or a group. There are democratic means by which rules can be changed if they are not acceptable.

JUNIOR Rules and officiating are set up for the achievement of educational standards and for competitive game situations.

Players' protests should be registered with the officials through the captain or coach.

Abiding by the rules and the decisions of the officials in a game situation is conducive to achieving the educational outcome desired.

ELEMENTARY Players should play the game as hard and as well as possible, in order to demonstrate superior performance for the purpose of winning.

Following the rules in the spirit of good sportsmanship is a vital part of learning to live in a democratic society.

Winning a game is important only when it serves as a measure of quality of performance; to win when one plays well is a measure of success; to win when one plays poorly is a measure of luck. To lose when one plays well is no disgrace; to lose when one plays poorly is to be expected.

Players should have a code of conduct and should recognize the effect on spectator attitude when the code is broken.

Coaches should have a code of conduct and should recognize the effect on players and spectators when the code is broken.

Players are obligated to accept official decisions and should be courteous at all times.

Officials may disqualify a player who is persistent or unpleasant in questioning decisions.

Spectators are expected to know and accept the rules and to respect the decisions of the officials.

ELEMENTARY Spectator sportsmanship can be as important as player sportsmanship.

Spectators who know the rules and understand the strategies of play enjoy the game more than those who do not.

Being a good sport as a spectator means being considerate of the opposing team and decisions made in their favor.

Spectators should not criticize players or officials during the progress of a game.

Not all decisions are as the players, spectators or even the officials would like them, but all decisions against either team should be accepted, even those that seem unfair at the time.

Spectators should abide by the rules and with the decisions, even when the side they favor could have won had the decisions been reversed.

Booing is evidence of disrespect and is unacceptable.

JUNIOR Announcers should interpret rules misunderstood by spectators.

WELFARE OF PARTICIPANTS

Specific policies and practices on eligibility rules, length of practice sessions, and length of season are set up to preserve and protect the welfare of participants in sports events. They serve to regulate a standard of academic, social, and civic responsibility for players and coaches, and determine such things as number of games to be scheduled, physical examinations of players, and transfer rules.

ELEMENTARY Policies based on knowledge of health and safety are applied to rest and conditioning between practices, games, and sports seasons.

JUNIOR Length of practices is based upon scientific evidence that playing when fatigued can be harmful to a player as well as to those against whom he plays.

The amount of time spent in practice and competition must be reasonable enough to allow players and coaches time to study, socialize, and participate in other activities.

JUNIOR Policies may be found in the handbook governing the league, conference, or athletic organization to which the participant belongs.

State and national organizations have been organized to oversee policies and practices arranged at the local level.

Eligibility rules are developed for the benefit of the individual participants and their opponents.

ELEMENTARY Eligibility rules may appear to work a hardship on an individual, but they maintain equal opportunities of play.

Eligibility rules in relation to age are designed to protect the health and safety of young players who might otherwise play against older and more experienced players.

JUNIOR Eligibility rules often serve as an incentive to scholastic underachievers.

Players who participate in contests outside of school may reduce or eliminate their school eligibility.

Birth certificates are now required as evidence of age eligibility for all students enrolled in school.

Eligibility rules are based upon scientific facts and research findings.

Each player should exercise his own responsibility in retaining his right to participate.

SENIOR Opportunities for players below and beyond the age limits are available in organizations outside the school.

Transfer rules are specified to protect eligible players.

SENIOR A transfer not accompanied by a change of legal address is improper, unethical, and unsportsmanlike.

All transfers are to be recorded officially with proper credentials.

Eligible players may not be replaced by players transferring from another district.

Changing legal guardianship to enable a player to transfer to another district is unethical.

A thorough medical examination is a prerequisite to granting permission to an individual to participate in sports activities.

ELEMENTARY Each participant needs a physical examination each year. A physical examination which is based on the best medical examination available is in the interest of preserving the student's health and safety.

No student should return to sports after an absence from school because of illness or injury, until he has been re-examined.

JUNIOR Physical examination of players has improved through the years as knowledge has increased and new medical tests have been introduced.

PROTECTIVE REQUIREMENTS

All persons who participate in activity programs should be trained in safety procedures, and should be knowledgeable about safety rules and regulations.

ELEMENTARY Safety rules and policies that have been developed by adults to protect children and which specify rules of safe conduct for use of equipment and facilities must be followed whether or not the reason for them is apparent.

Accident prevention often requires supervision of an activity. Accordingly, participants must always respect the supervisor's judgment.

If spotters and class assistants are trained, they are more safety-conscious and can help prevent accidents.

JUNIOR Squad leaders, captains, custodians, and officials should be aware of potential hazards.

Play is more safe and performance more efficient when special precautions have been taken prior to performance in any situation, formal or informal.

ELEMENTARY Proper conditioning is a necessary prerequisite to practice and performance. Practice to develop consistency of performance is a prerequisite to formal competition.

Only official, inspected equipment that is in good condition should be used; defective equipment is hazardous.

Protective apparel should be worn, and is mandatory when the rules so specify.

The most effective method of accident prevention is knowledge of one's capabilities and effective judgment as to one's own limitations.

ELEMENTARY Such things as playing too long, swimming too far, climbing too high, and overestimating one's ability to handle a situation often result in accidents and injuries.

Individuals in certain age groups are more apt to accept challenges than are others, regardless of the potential for injury.

Policies and standards for conducting and participating in activities are based on the physical capabilities of different age groups and the physical characteristics of the two sexes. Sex differences and age differences usually determine the acceptability of sports activities for an individual.

ELEMENTARY Selection of activities should be based on age differences with an emphasis on maturity, especially as maturity relates to strength and the ability to understand directions and instructions.

Limitations based on sex differences are related more to cultural and social attitudes than physical differences.

During puberty when sex differences become apparent, boys develop greater strength than girls and their athletic performance is generally superior.

JUNIOR When girls reach pubescence, they must be protected from body contact above the waist; therefore, girls rules are written to eliminate intentional body contact.

It is more appropriate for boys and girls to play against other boys and girls than for girls to play against boys.

Students should be knowledgeable about, and capable of practicing, certain precautionary and preventive measures related to preserving health and safety.

ELEMENTARY Periodic physical examinations should be a regular part of life.

First-aid techniques should be common knowledge at appropriate age levels, and every student should know his doctor's name, his parents' full names and location, his home address, and any allergies he may have.

Procedures for handling emergencies should be set up and practiced, including evacuation in case of fire, tornado, or civil defense problems.

JUNIOR Adequate medical insurance coverage is considered a necessary part of modern life. Such insurance makes medical expenses much easier to meet.

Swimming and lifesaving skills should be taught at an early age, and water-rescue techniques included as soon as possible, because drownings can often be traced to insufficient knowledge or skill in water activities.

A medical doctor should be on the bench or on call at all athletic contests. Injuries can be compounded or complicated by delay or improper handling.

Children should be provided with play areas which enhance personal safety.

ELEMENTARY Areas that are free from hazards should be selected.

Areas should be free from congestion and crowds. Nonplayers should be restricted from the play areas.

Adequate space between activities should be provided to avoid overlap.

If conditions change during play so that the area becomes unsafe, play should be stopped.

Special rules may be made as safeguards against dangerous kinds of play.

Inherent dangers in certain areas associated with physical education require certain precautions and a specific level of behavior.

ELEMENTARY Problems of behavior and corresponding frequency of accidents increase when students' conduct is unsuppressed.

Locker and shower rooms should be supervised whenever they are in use. Water fights in showers, tag or running on pool decks, and wrestling or chasing in locker rooms are potentially extremely hazardous.

All accidents, however minor, should be routinely reported to the teacher or the person in charge.

ELEMENTARY Vital information as to causes, witnesses, extent of injuries, and action taken should be recorded for purposes of follow-up action.

Facilities and equipment which are potentially very hazardous should not be used by students without permission or when supervisor is absent.

ELEMENTARY Heavy apparatus and gymnastic equipment should be used only with permission or when supervised.

A lifeguard should be present during water sport activity.

IMMEDIATE EFFECTS OF ACTIVITY

When a person is active the heart rate increases.

ELEMENTARY Exercise requires that more blood be supplied to the muscles.

A strong heart is needed to engage in vigorous exercise or work.

To be sure the heart is sound and can stand vigorous exercise, first one should have a medical examination.

JUNIOR Exercise increases the rate of oxygen-carbon dioxide exchange in the muscles.

Increased heart rate provides the potential for better circulation in the muscles.

A return to the resting pulse rate results in a period of inactivity following exercise.

ELEMENTARY Occasional rest periods should be taken during strenuous activity.

Unless the exercise is very strenuous, a slacking of pace may be sufficient to relieve the heart.

JUNIOR Short rest periods decrease the needs in the muscles to near metabolic level. A muscle is supplied with adequate blood flow while needs are high during activity, but energy is conserved by a prompt return to normal activity or rest.

The heart response is adjusted according to the needs of the tissues.

SENIOR Alternation of activity and rest, or strenuous and light activity, postpones cardiorespiratory fatigue.

When a person exercises, the muscular action helps to return the venous flow of blood to the heart.

ELEMENTARY Muscular action keeps a fresh supply of blood moving into the muscles, thus enabling better muscular function.

JUNIOR In much of the body, blood is being returned upward. Pressure of muscular contraction and alternation of muscle action pump blood upward.
Quiet exercise (muscle contraction without movement) is sufficient to assist in the flow of blood.

SENIOR In the absence of muscular contraction, venous flow is moved only by pressure of arterial blood behind it.
Muscular action helps reduce edema in the feet and legs.
Keeping the blood moving contributes to an adequate blood supply for the head and upper part of the body.
Muscular action on the blood flow helps to relieve the heart.
Long periods of quiet standing should be avoided.
Massage may be used as a substitute for those unable to find time or space to exercise, or whose heart will not tolerate vigorous exercise.

When a person exercises strenuously there is vascular dilation in the muscles.

JUNIOR Contraction of the muscle requires a blood supply to all acting muscle fibers.
Muscle tissue has a better blood supply as a result of exercise.

SENIOR Capillaries respond as do other tissues to use and disuse.
The muscle will have greater endurance if it is exercised regularly.
A nonfunctional motor unit can be activated only gradually because capillary function must be restored.
Frequent exercise will keep the capillaries in good condition.

When a person exercises regularly there is extension of the capillary bed in the muscle so that muscle cells are more completely supplied.

SENIOR When a motor unit which has been out of use is called upon for action, the process of atrophy must be reversed.
Contraction of the muscle requires a blood supply to all acting muscle fibers.
Other motor units have an increased capability in building up their capacity.
The muscle will have the possibility of building greater strength and greater endurance.
The conditioning process should improve the circulation in a muscle.

When exercise ceases the pulse rate adjusts to near resting level within two or three minutes.

ELEMENTARY Occasional rest periods should be taken during strenuous exercise.
As the needs in the muscle are decreased, the heart slows down.
A slower pulse constitutes a saving for the heart.

JUNIOR Energy consumption decreases and production of waste products is cut abruptly, thus decreasing needs when occasional rest periods are taken.
Long periods of rest are not necessary.

When building endurance, a change of pace will provide sufficient rest for the normal heart.

Venous return to the heart is pumped directly to the lungs; i.e., it does not accumulate in the heart.

JUNIOR The normal heart empties the chamber on each contraction.
The blood is reoxygenated promptly.

SENIOR The increasing venous return expands the heart; this extension stretches the cardiac muscles and thereby produces a more effective contraction, resulting in a larger stroke volume.
The heart is protected from added internal pressure.

The pulse of a trained performer returns to normal more quickly following exercise than that of an untrained person.

ELEMENTARY The trained athlete fatigues less readily than a person in a nontrained state.
The individual who wishes to be able to do strenuous exercise or work without undue fatigue should condition his body for this work.

SENIOR The heart of the trained performer has a greater stroke volume.
Capillary functions are better in the trained individual. This facilitates internal respiration.
The amount of rise in pulse rate following exercise serves as one indication of fitness level.
The speed with which the pulse returns to normal is an indication of level of circulatory efficiency.

When a person exercises, breathing becomes deeper and more frequent.

ELEMENTARY When muscular activity occurs, carbon dioxide is released into the blood stream. This stimulates the respiratory center in the brain and breathing rate and depth are increased.
Greater respiratory action helps to supply more oxygen for the blood and thereby delays fatigue.

JUNIOR Exercise of a vigorous type promotes more efficient deep breathing than do breathing exercises.
Breathing exercises may produce overoxygenation.

The breathing of a trained performer is deeper and slower during exercise than that of an untrained performer.

ELEMENTARY The trained athlete fatigues less readily than a person in a nontrained state.
The trained athlete breathes more comfortably during exercise.
The individual who wishes to be able to do strenuous exercise or work without undue fatigue should condition his body for this work.

SENIOR Respiration is controlled by the respiratory center in the medulla (central nervous system). This center is activated by the carbon dioxide content of the blood. In the trained state the carbon dioxide is removed from the muscles by better capillary function, and given off in the lungs faster by a larger stroke volume of the heart. The end result is slower respiration.

Strenuous exercise can quickly deplete the oxygen supply in the muscle.

ELEMENTARY Vigorous exercise, especially by groups, should be done outdoors or in a well ventilated room.

SENIOR Oxygen is used in the release of energy from the blood sugars during muscular contraction and in the resynthesis of lactates immediately after contraction.

Strenuous exercise can not continue unless there is adequate oxygen delivered in the muscles.

Strenuous exercise builds a carbon dioxide supply in the muscle.

JUNIOR Carbon dioxide is produced in direct proportion to strenuousness of muscular activity. It is removed by the blood in direct exchange with oxygen, but frequently at a slower rate than it is being produced.

Strenuous exercise can not continue unless carbon dioxide is removed fairly promptly from the muscles.

External respiration (in the lungs) adjusts to the demands made upon it.

ELEMENTARY One can expect heavier breathing not only during exercise but also for a time following cessation of exercise.

JUNIOR External respiration provides for expulsion of carbon dioxide obtained from the blood, and substitution of oxygen from the inhaled air.

An appropriate balance of oxygen and carbon dioxide is maintained in the blood so that the strenuous exercise may continue.

Forced breathing does not provide for better use of oxygen in the tissues.

Internal respiration (in the tissues) adjusts to the needs created in the muscles and depends upon circulatory efficiency.

JUNIOR Internal respiration provides for delivery of oxygen to tissues and removal of carbon dioxide and other waste products of contraction.

Strenuous exercise can be continued for a longer period of time when oxygen is readily available in the muscle.

Strenuous exercise, particularly for the untrained, can cause feelings of dizziness and painful respiration.

JUNIOR Circulation and oxygen supply are not meeting the increased needs of the muscles.

Dizziness results from inadequate blood supply in the brain.

The trained performer fatigues less readily and is subject to less discomfort than the untrained person.

The individual who wishes to do strenuous exercise without undue fatigue and discomfort should condition his body for this work.

A muscle contracts only when it receives nervous stimulation sufficient to elicit a response.

SENIOR A nervous stimulation is an electrical impulse which travels along the nerve pathway.

A nerve impulse originates in a receptor, a specialized ending on a neuron.

The effector neurons into the muscle have branched endings connecting with the muscle cells.

A predictable muscular response can be expected in a given situation.

A muscle which is deprived of its source of stimulation by damage or blocking of a nerve, is incapable of action.

The establishment of consistent pathways for specific nerve impulses throughout the nervous system provides the basis for motor learning.

When a muscle is used, the nervous system tends to inhibit antagonistic action, thus facilitating movement (reciprocal innervation).

JUNIOR In perfecting of motor skills, one should work toward the maximum of relaxation consistent with good performance.

SENIOR Resistance in the synapses of neurons leading antagonists becomes greater than in those in the channels for the desired action.

Inhibition apparently occurs at the synapses.

Inhibition of stimuli to antagonistic muscles makes for easier, smoother, more economical performance.

Free functioning of the process of reciprocal innervation delays fatigue.

Forced or static efforts tend to produce sensations of muscular rigidity and fatigue.

SENIOR Fixed or static action is achieved by a matching of effective pull of antagonistic muscles.

Strenuous and static action is possible only with fixation of origin of acting muscles; this produces more widespread tension and rigidity as the action is prolonged.

Strong effort against a stronger resistance elicits muscular tension without shortening.

Forced effort produces tensions; static effort prolongs tensions and accelerates fatigue.

Rhythmical, swinging exercises tend to produce relaxation.

ELEMENTARY Rhythmic, swinging exercises can be used effectively in warm-ups and for a change of pace in an exercise series.

Rhythmic, swinging exercises can be used to learn relaxation in relation to coordinated patterns of movement.

JUNIOR Pendular movement, i.e., that in which the speed and range of movement is governed by length and center of mass of the swinging segment, is performed with less muscular effort than fast or controlled movements.

Gravity provides the restraint on pendular movement rather than antagonistic muscular effort.

When a muscle is stretched suddenly and extensively, it contracts reflexly (stretch reflex).

ELEMENTARY Stretching for improvement of flexibility should be done with a slow, sustained stretch to protect the muscle against tearing.

JUNIOR The ligaments and capsule at the joint are protected against excessive stretching and possible tearing.

SENIOR Slow stretching or moderate stretching is first accomplished by relaxation of the muscle. Sudden stretching provokes the stretch reflex as a means of protecting the muscle from damage.

Posture exercises must be done with care to avoid strengthening the wrong muscles by the stretch reflex. For example, arm flinging is mistakenly used to strengthen the scapular adductors; it actually produces stretch reflex in the anterior deltoid-pectoralis major, and exaggerates round shoulders.

A slow stretch can increase the resting length of a muscle, but a sudden stretch tends to decrease resting length.

Movement produces sensations in the muscles and joints which can be interpreted as range of motion, position and plane, rate of motion, etc.

ELEMENTARY The kinesthetic sensations can be used as an aid in learning new motor skills.

The kinesthetic sense aids in refreshing skills previously learned.

Kinesthetic functions enable the blind to be proficient at motor skills.

Kinesthetic sensations aid in the process of refining skills.

JUNIOR Kinesthetic sensations are a protective mechanism in time of danger.

Kinesthetic sensations enable the individual to perceive the position and movement of a body part or of the entire body.

Sensations become meaningful to the person on the basis of experience.

SENIOR There are receptors in the muscles, ligaments, tendons, and articular cartilages which are stimulated by the tensions created in the muscles during contraction and stretch, and by the changing relationships of articulating parts (kinesthetic receptors).

Kinesthetic sensation, as a guide to movement, enables the individual to concentrate on something other than the performance of the skill.

Kinesthetic experience provides the empathy necessary for maximum value in observing demonstrations or films depicting skills.

A movement response to a stimulus or situation produces a tendency to move in the same way again under like stimulation.

ELEMENTARY Practice is essential to learning.

Motor learning results from repetition.

Habit results from repetition of a response.

Wrong techniques may become habitual as well as may correct ones.

Practicing a skill incorrectly also produces the tendency for it to be repeated in that form.

SENIOR The nervous impulse in any stimulus-response action travels a given pathway; thereafter a stimulus from the same source tends to travel the same pathway and produce the same results.

Repetition of a muscular action tends to produce a conditioned response.

When exercise is initiated, there is a feeling of warmth.

ELEMENTARY Activity can be used to keep the body warm and comfortable.

Vigorous activity is more tolerable when temperature and humidity are not too high.

Lack of protective clothing after exercise in cool or cold temperatures can result in sudden loss of body heat.

The heat which is produced in the muscles is important in maintenance of body temperature.

JUNIOR The heat produced in the contracting muscle warms the muscle and blood flowing through it and facilitates subsequent muscular action.

SENIOR Heat is produced by the processes of contraction, i.e., the conversion of energy in the blood sugars into energy used by the muscle cell, and the removal of waste lactates after contraction.

The acting muscle has a more thorough capillary flow and thereby produces a feeling of warmth.

Heat is produced by muscular activity and the control center for body temperature acts to permit proper amount of perspiration.

ELEMENTARY As heat is produced in the body, the temperature of the body is kept down by evaporation of perspiration from the skin.

Regulation of body temperature is essential for comfort and safety.

Clothing should permit evaporation of perspiration.

JUNIOR The central nervous system has a "thermostatic" control of body temperature which controls circulation in the periphery of the body, perspiration determined by the amount of heat produced within the body, and protection against heat loss provided by clothing and the environmental conditions.

Perspiration removes fluid and lactates from the body.

Strenuous activity can normally be continued for extended periods in spite of the production of heat.

The level of salt loss in the body is a significant factor.

SENIOR Body fluids and body weight may be significantly reduced by vigorous exercise.

As a person starts exercise after being inactive there is increased relaxation and freer movement.

ELEMENTARY A performer can relieve anticipatory tensions by starting some kind of warm-up activity.

JUNIOR Preliminary activity provides a gradual increase in the level of efficiency before getting into efforts of maximum level.

Movement becomes more economical of energy expenditure.

Skill performance will be more consistent as tensions are relieved.

SENIOR Viscosity of the muscle tissue is reduced by the heat produced.

Viscosity of the muscle tissue is reduced by the process of being alternately shortened and stretched.

FATIGUE AND IMPAIRMENT

Waste products which accumulate in the muscle may interfere with proper functioning.

ELEMENTARY

Fatigue in the muscle is a physiological accompaniment of prolonged exercise.

The proper conditioning program delays the onset of fatigue.

Clothing should not restrict circulation to the active muscles.

JUNIOR

The accumulation of carbon dioxide and lactic acid during exercise makes the muscle less responsive to stimulation, but more sensitive to pain.

Conditioning for strenuous exercise is necessary to provide for better removal of waste products.

Anything the performer can do to conserve energy expended will delay the onset of fatigue.

The effect of waste products on contraction may make prolonged exercise self-limiting.

The trained athlete adjusts more completely to exercise demands.

ELEMENTARY

The superior athlete must have a prolonged period of training.

Training pays dividends in terms of better work output.

Training pays dividends in terms of delayed fatigue.

JUNIOR

The trained athlete has better circulation in the muscles and therefore tires less readily and recovers more quickly.

The training of the athlete should be determined by the strenuousness of the activity.

SENIOR

The trained athlete has a larger stroke volume and a slower pulse.

The trained athlete may reach "second wind" for improved respiratory relief, if the exercise is strenuous.

Fatigue modifies kinesthetic sensations.

ELEMENTARY

Types of work should be alternate to prevent fatigue and avoid accidents.

JUNIOR

Interference with kinesthetic perception leads to errors in skill.

Interference with kinesthetic perception can lead to problems of safety.

SENIOR

The fatigued muscle must use more motor units to achieve a function and therefore the segment is perceived as heavier.

The sensation of movement may be almost completely blocked in a fatigued muscle.

In muscles which are forced to work without warm-up, lift excessive loads, or participate in fast, vigorous activity, there may be tearing of the muscle tissue.

JUNIOR

A muscle which is damaged has a reduction in capacity.

A muscle which is damaged must have a rest period of several hours or longer.

A performer should warm up immediately preceding strenuous activity, as a means of minimizing the possibility of muscular strain.

A performer should know the best mechanics for a task and realize his own limitations.

SENIOR Excessive stretching of a muscle, or stretching while it is contracted, may tear the muscle fibers or separate the fibers from the tendon or membrane of attachment.

Excessive stretching, or stretching of antagonists while in action, may rupture capillaries and result in interference with circulation, and produce hemorrhaging in the muscle.

In strenuous activity following heavy eating, or when the effort calls for fixation of flexed trunk position, nausea may result.

JUNIOR Muscular effort draws blood away from the viscera and into the muscle, with possible interference with action in the digestive track.

The prolonged flexed trunk position interferes with circulation.

The experience of nausea in an activity can be a psychological barrier to future effort.

Nausea has the effect of inhibiting muscular action.

The performer should avoid heavy eating immediately preceding exercise.

The performer should seek an optimum working position.

LONG TERM EFFECTS OF ACTIVITY

With regular exercise the heart muscle is strengthened, thereby minimizing fatigue and strain.

JUNIOR The heart is muscle tissue and develops under the same laws of use and disuse as other muscles.

Exercise should be vigorous enough to make circulatory demands as well as to provide muscular action.

At least part of the day's activity should involve gross body movement as well as more localized movement.

SENIOR A strong heart is less likely to fail under stress of various types.

Regular exercise makes a person more resistant to muscular fatigue.

ELEMENTARY Regular exercise can make a person more efficient and comfortable by eliminating fatigue.

Regular exercise will help maintain strength which has been developed.

JUNIOR Regular exercise makes the heart more efficient and thereby provides better circulation which is necessary for general endurance.

Exercise should be planned to give a reserve beyond the usual demands on the muscle.

SENIOR Regular exercise maintains a better capillary bed throughout the muscles used.

Regular exercise designed to develop strength eventually provides more motor units capable of cooperating in vigorous effort and in this way creates greater muscular endurance.

A person with a reserve of strength and energy has a better feeling of well-being and can better tolerate heavy physical work.

ELEMENTARY The habit of regular exercise should be established. Exercise should be engaged in for building muscle strength and for inducing relaxation.

JUNIOR Adequate strength for the day's activity eliminates what would otherwise be a constant stress of fatigue.

A reserve of energy makes the person more likely to seek activity.

Regular activity establishes a habit which promotes further activity.

Regular exercise provides a change of pace and aids relaxation.

ELEMENTARY A habit of daily exercise should be established.

JUNIOR The individual should seek activity which is relaxing for him.

The regularity of exercise establishes a pattern of release from tension.

SENIOR The alternation of exercise and sedentary or mental work is a source of different action patterns and therefore has the potential to relieve tensions.

Physical activity is a means of relieving tensions.

A muscle which is not used for a period of time becomes flaccid and weak.

JUNIOR A muscle which is not used loses tonus.

A muscle which is not used loses in cross section or size and is weaker as a result of that loss.

Exercise should be sufficient to maintain not only tonus but strength adequate to protect muscles and joints from strain.

SENIOR A muscle which lacks tonus and strength subjects other tissues to possible strain and injury.

Weak muscles are unable to maintain proper alignment of body segments, which may result in changes in bone structure.

Muscular stress on bone causes the bone to adjust internally and strengthen itself against the stress.

ELEMENTARY A bone must be strong to withstand the forces operating on it during physical activity.

Strong bones minimize the danger of fractures in falls and other emergencies.

JUNIOR All muscles should be used regularly to promote normal bone growth.

Weight-bearing on all bones is desirable, even the upper extremity.

Weight-bearing should be practiced with the body in good alignment.

SENIOR Internal bone growth is dependent upon the stresses created by muscle pull, pressure in articulations, and weight-bearing.

Red blood cells are created in the marrow of the long bones.

JUNIOR An adequate supply of red blood cells is essential to a feeling of well-being.

An adequate supply of red blood cells, functioning to transport oxygen through the blood stream, is essential to engage in vigorous activity.

SENIOR A bone which is well developed has a better capillary bed in the marrow.

Circulation in the bone must be effective for it to develop properly and for development of the red blood cells.

Regular exercise strengthens muscles, thus minimizing the tendency to articular and muscular injury.

JUNIOR The first line of defense for joint protection is the strength of the muscles. If the muscles are strong enough to withstand force at the articulation, the joint will not be moved beyond its physiological limits.

One goal in building strength in muscles is protection of the articulations.

Muscular protection of joints is especially important in the lower extremities.

Bones which are under regular dynamic stress are slower to show degenerative effects of aging.

JUNIOR Lifelong patterns of physical activity are important for all persons.

SENIOR The laws of bone growth operate throughout life.

Strong bones are a safeguard for the older person.

The aging of the bones in middle or advanced years may be premature or late, depending upon the amount of regular activity.

Periods of immobilization should be kept at a minimum.

Regular exercise of a muscle improves the tonus of the muscle.

JUNIOR Proper tonus is essential for good posture.

Postural muscles need to be kept in good tonus.

Good tonus permits a quicker response and is a safety measure in motor activity, either at work or play.

Regular exercise tends to keep muscles elastic and increase joint flexibility, and is a means of maintaining a flexible body.

ELEMENTARY Frequent stretching makes possible a wider range of motion while conserving energy.

It is easier to maintain flexibility than to restore it.

JUNIOR Ability to relax antagonists improves flexibility.

A flexible body can be moved with a minimum of effort.

Free joint range is dependent upon length of ligaments and fascia and elasticity of muscles.

Regular use of the abdominal muscles helps prevent lordosis and sway-back.

ELEMENTARY Strength of the abdominals is essential to support the pelvis and control the alignment of the lower back.

Weak abdominals result in poor alignment and poor posture, i.e., the abdominal wall becomes convex and the gluteals are protruding posteriorly.

Students should learn how to use the abdominals in bending and twisting.

JUNIOR Students and adults should learn to use specific abdominal exercises as a means of preventing postural deviations centering in the lower back and pelvis area.

SENIOR Lumbar and sacroiliac articulations become painful if the curvature of the lumbar area is increased.

Regular exercise performed with the body in good alignment can develop a feeling for correct posture.

ELEMENTARY Posture can not be maintained at its optimum without frequent experience in that optimum position.

Good alignment usually has to be learned.

JUNIOR The kinesthetic sensations of those positions which are frequently repeated tend to insure their being repeated again.

The kinesthetic sensation can be used effectively in controlling body alignment.

Regular and correct use of the muscles of the shoulder girdle can minimize the possibility of round shoulders.

ELEMENTARY Round shoulders can be a source of unnecessary fatigue.

Round shoulders are frequently the result of a habit of slumping.

Round shoulders spoil appearance and generally give a poor impression of the individual.

JUNIOR Round shoulders make it difficult to fit clothing properly.

Gravital pull is a stimulus for improved tonus.

SENIOR Good tonus of the adductors of the scapulae is essential to keep the shoulder girdle retracted against gravity.

Localization of action in the adductors of the scapulae makes for more relaxed shoulder lines with scapulae properly placed on the back of the thorax.

Round shoulders are frequently associated with spinal slumps.

Regular exercise is beneficial in relieving functional dysmenorrhea.

ELEMENTARY Regularity of exercise should be employed as a health practice, not just as recreation.

JUNIOR A flexible and free-moving trunk aids circulation in the viscera and thus relieves dysmenorrhea.

A small investment of time in daily exercise can minimize periodic discomfort and aid in a prevention of associated disability.

SENIOR Exercise aids capillary and lymph circulation, thus avoiding dysmenorrhea.

Regular exercise helps to prevent constipation.

ELEMENTARY Regularity of exercise should be taught as a health practice, not just as recreation.

JUNIOR Exercise may have therapeutic as well as preventive value.

SENIOR A flexible and free-moving trunk aids circulation in the viscera, and action aids peristalsis.

Strength of antigravity muscles is essential for good posture and delay of fatigue.

SENIOR The antigravity muscles are in action so continuously that they need more than just enough strength to support the body weight.

Gravital pull is a constant force and the antigravity muscles must be able to cope with it.

The principal muscles involved in body alignment are the spinal and lower extremity extensors, and the scapular adductors.

Inactivity of a joint results in a shortening adaptation of connective tissue.

ELEMENTARY It is easier to maintain flexibility in a joint than to restore it.

JUNIOR Connective tissue is relatively nonelastic.

The connective tissues affecting a joint are ligaments, capsule, and fascia.

Freedom of movement at the joints is a means of conserving energy.

SENIOR Connective tissue adapts slowly to lack of stress.

Shortening of connective tissue reduces flexibility.

Shortening of connective tissue may produce localized or diffused pain.

Added muscular strength may result in reduction of flexibility.

SENIOR Increased strength is brought about by hypertrophy of the muscle.

The extensibility of the muscle is inversely proportional to its cross section.

Excessive strength building without consideration for flexibility may leave the individual with impaired muscle elasticity.

Inelasticity of an antagonist muscle makes each movement more costly.

Strength and flexibility should be worked on concurrently.

A muscle-bound condition generally occurs only as the result of excessive development.

Muscular activity may have therapeutic value.

ELEMENTARY The development of poor posture, or improper body alignment, can be halted or reversed by proper exercise done regularly.

JUNIOR Periodic discomfort can be minimized by regular activity adequate to stimulate circulation.

Exercise may be directed toward a very specific purpose as well as for the promotion of overall good health and general recreative pleasure.

Students should learn how to evaluate their own posture and what to do about deviations.

SENIOR Therapeutic value lies mostly in increased tonus and/or strength, improved circulation, and release of neuromuscular tensions.

WEIGHT CONTROL

Regular exercise tends to increase the metabolic rate.

JUNIOR

The calorie is the unit of fuel for motor activity and metabolic needs. Weight can be lost only if the calories burned over a period of time exceed the number taken into the body during that time.

A higher metabolic rate uses more calories.

Exercise is the normal companion to a reduction of food intake.

SENIOR

Regularity of exercise is the best and most desirable method of increasing the metabolic rate.

Regular, vigorous exercise is an aid in weight control.

ELEMENTARY

Exercise requires energy in proportion to its vigorousness.

Excess weight is a health hazard.

JUNIOR

A program of regular exercise will increase the metabolic rate for consumption of more calories of energy between exercise bouts.

Regular exercise is a sound and effective method of weight control; a few heavy doses can have only temporary effect, at best.

Continuing exercise and a restricted diet are the only avenues to weight loss for the average individual.

Weight should be kept at a fairly steady level, and adipose tissue should not be deposited in quantity anywhere in the body.

JUNIOR

Added weight makes the individual less prone to engage in exercise, thus starting a vicious cycle.

Prevention of undesirable weight increase should be practiced, rather than a never-ending series of gains and losses.

Weight loss should be gradual, and then maintained at the proper level.

SENIOR

Added weight makes all movements more costly and may eventually constitute a strain on the heart.

Fat deposits in muscles, arteries, or viscera interfere with normal functioning. Interference with body functions may lead to cumulative trends toward illnesses.

There is a tendency for a person to add weight as he ages. This should be counteracted by a regimen of proper exercise and diet initiated early in life.

DEVELOPMENT OF BODY SYMMETRY

Regular exercise for all parts of the body helps to maintain balance between muscle groups and to minimize tendency to postural deviations.

ELEMENTARY The regular exercise program should give consideration to use of all muscles.

SENIOR Muscles tend to stretch their antagonists and should not be so strong or of such high tonus that they change the alignment of the segment.

Proper balance in strength and tonus of antagonist muscle groups can maintain alignment with a minimum of effort.

Regular use of intrinsic and extrinsic muscles of the feet, makes the feet more capable of propulsion and body support.

ELEMENTARY The muscles which support the foot are located in the lower leg as well as in the foot itself.

Muscular strength is the first requirement for the proper support of the foot.

Good foot mechanics, in relation to locomotion and other skills, should be learned.

JUNIOR A weak foot causes muscle and joint strains throughout the body.

Strength-building for the muscles of the foot should be included in an exercise program.

Muscular activity stimulates growth and normal development of children.

ELEMENTARY An efficient, healthy body must be developed continuously during the growing process.

The child needs daily activity and in greater amounts than the adult.

The activities of children should be varied in type to properly utilize all the parts of the body.

Muscle action of a vigorous type increases the strength of the muscle and stimulates bone growth.

Symmetry and body alignment are at optimum development when both sides of the body are used equally.

ELEMENTARY Inequality in strength of muscle groups may cause changes in body alignment.

Activity programs should use all muscle groups.

JUNIOR Lateral imbalance is a strain on joints and muscles and also affects the antero-posterior development.

SENIOR Daily activities and some sports may tend to be unilateral; planned exercise programs can help to avoid imbalance.

Contralateral development is valuable as therapy in convalescence from injuries.

SENIOR Muscles in an injured extremity may be used in isometric contraction while the corresponding uninjured limb is being exercised. Muscle strength can thus be maintained.

Tonus can be maintained by this process over long periods of inactivity and the level of strength can be kept from dropping appreciably during inactivity.

CAPACITY FOR EFFORT

MUSCULAR STRENGTH

Exercise increases the force that a muscle can exert.

ELEMENTARY Strength is basic to good performance in physical skills.

Exercise increases strength partly by increasing the amount of tissue in the muscle.

Physical education programs should include activities which are vigorous enough to strengthen the major muscle groups of the body.

JUNIOR Strength can give a person a marked advantage in sports which require severe exertion, such as wrestling, swimming, and gymnastics.

SENIOR Exercise increases strength partly because of neuromuscular adaptations, including increased stimuli of the anterior horn cells and reduced resistance to the passage of impulses across the synapses in the neuromuscular junctions. The impulses are spread more readily and more muscle fibers are brought into action.

Exercise causes an increase in muscle size.

ELEMENTARY In every muscle there are fibers that are unused or small from lack of use. These fibers develop in response to exercise demands made upon them.

Gains in muscle size can have a positive effect upon self-concept and self-confidence of growing children.

Physical education programs should include activities which are vigorous enough to cause an increase in muscle size.

JUNIOR Male and female appearance may be improved by muscle-building exercises.

SENIOR An increase in muscle size occurs when the body overcompensates in replacing muscle materials which were lost during repeated overstrenuous muscular contraction.

Muscles atrophy when not exercised.

ELEMENTARY The muscles of a broken limb which is encased in a cast should be exercised to prevent muscular deterioration.

When unused, muscle fibers decrease in size and lose ability to be called into use.

JUNIOR Exercise can be therapeutic in counteracting the debilitating effects of atrophy which results from muscle inactivity.

When one limb is rendered inactive because of injury, its strength may be improved by exercising the contralateral limb. This phenomenon is known as cross education.

A person who is confined to bed because of illness may maintain general muscle strength with appropriate exercises.

SENIOR The inability of unused muscle fibers to function is partly due to a loss of facility of transmission of the nerve impulse across the motor end plate in the muscle fiber.

Slow and extended training will produce strength increases that will last longer than strength that is acquired rapidly.

SENIOR The reason for fixation of strength by slow training is not known.

The person who can retain strength longest after cessation of training will be better prepared for the demands of physical activity than the person who loses strength more quickly after training.

Weekly training sessions do increase strength, although at a slower rate than more frequent sessions.

After strength is increased or restored through intensive exercises in the physical education program, training should be continued at longer intervals for greater strength retention.

An effective way to develop strength of muscles is to exercise them against gradually increasing resistance.

JUNIOR Muscles grow larger and stronger only when required to perform tasks that place loads on them over and above previous requirements. This is the overload principle which is the rationale for all progressive resistance exercise systems.

The strengthening effects of exercise can be decreased or lost entirely if exercises are too mild and are not graduated in intensity.

When gains in strength are desired, it is necessary to select appropriate activities and plan for systematic increases in intensity of exercise.

Weight training, in which the individual lifts weight — commonly barbells — is an effective system for strengthening muscles.

The strength of a muscular contraction during activity is dependent upon neuromuscular coordination.

JUNIOR A person can direct his strength in an effective and meaningful way by improving his skill in the activity to which the strength is to be applied.

In striving to throw a ball a long distance, it is as important to practice throwing as it is to train the muscles involved.

SENIOR Elimination of extraneous motion and reduction of tension in antagonistic and postural muscles are two muscle-strengthening results of training.

When a muscle contracts against resistance, the strengthening effects of that contraction do not benefit other muscle groups.

JUNIOR According to the principle of specificity, the training effects of a given exercise are usually specific to that exercise alone.

Proper use of the principle of specificity can increase the efficiency of training for a particular athletic event.

The athlete-in-training should develop physical conditioning with exercises that most nearly correspond to the movements in the particular sport.

In developing general strength through weight training, the beginner will achieve greater overall development by following a general body-building program for some time, and then adding exercises to develop muscles not responding satisfactorily.

Both isometric and isotonic forms of exercise improve muscular strength, and there is no conclusive evidence of any difference in the effectiveness of either form in increasing strength. However, each form has certain advantages and disadvantages.

SENIOR The basis for gains in muscle strength appears to be muscle tension against resistance. Both isometric and isotonic forms of training are based on the principle of muscle tension and, apparently, both forms provide sufficient tension for optimum results.

The advantages and disadvantages of isometric and isotonic exercises may be compared as follows: • Isometrics require very little time and effort. • When used in connection with active training for a sport, isometrics cause less interference from fatigue and time requirements. • Isometrics increase strength without benefiting muscular endurance, while isotonics increase both strength and endurance. • Isotonics place less stress on the heart and circulation than do isometrics, which can be an advantage to persons with high blood pressure conditions. • Isometrics lack the beneficial effect upon range of motion that is provided by isotonics.

The choice of type of exercise (isometric vs. isotonic) can be made on the basis of time available, interference with other activity, and other factors which contrast these two forms of exercise, without regard to effectiveness of strength development, which is comparable for both forms.

Whereas conditioning with isometric exercises could effectively be carried out concurrent with training in a vigorous sport such as football, weight training plus football practice would demand energy output too high to be sustained, causing the athlete to become overly fatigued and lose weight and strength, instead of gaining them. For best results, weight training should be engaged in prior to rather than during active training for a sport.

Contrary to popular belief, girls can gain strength through weight training without fear of developing bulging, unattractive muscles.

JUNIOR Girls may participate in healthful exercise without fear of a masculinizing effect, specifically, the development of bulging muscles.

There should be no concern that physical education programs for girls which include strenuous exercises will adversely affect the participants.

SENIOR The gain in strength is more striking than the hypertrophy of the muscle; it is possible to increase the power of muscles three times or more without a proportional increase in volume.

As a consequence of training, increases in muscular strength are accompanied by increases in speed of movement. The gain in speed is produced as much by weight training as by other forms of strengthening exercises.

JUNIOR Until research dispelled the misconception, it was believed that weight training automatically caused muscle-boundness, a condition which was thought to slow down muscular contractions.

Coaches who formerly avoided weight training are now encouraging their athletes to benefit from this activity.

SENIOR While reasons for gains in strength and speed of movement are not fully understood, it has been suggested that improved vascularization in trained muscles, which makes more fuel and oxygen available, increased storage of chemicals in muscles, and improved transmission of nerve impulses to the motor units all contribute to greater muscular efficiency.

Activities differ in their capacities for developing strength.

JUNIOR When undergoing physical conditioning, it is necessary to select activities that rate high in intensity, frequency, and duration; otherwise, the exercise may not serve its purpose.

If the strenuousness (intensity, frequency, and duration) of various activities is known, it should be possible to plan a graded conditioning program that starts out moderately and increases in work load as muscles grow stronger.

SENIOR The amount of strength developed through exercise is affected by the magnitude of the stress imposed, the frequency with which the stress is imposed, and the duration of the overload effort.

Circuit training can be used to develop strength.

JUNIOR Circuit training, with its characteristic circular arrangement of a group of activities, is designed to facilitate training by large groups.

Circuit training provides a convenient method of continuous activity in a restricted space, using a variety of exercises.

Circuit training uses the principle of progressive loading and includes exercises with and without weights.

In circuit training, work is progressively increased in a given period of time or the same amount of work is performed in progressively shorter periods of time.

SENIOR Circuit training differs from older conditioning systems such as weight training in employing submaximal resistance and in placing the emphasis on time rather than on resistance.

Circuit training has the advantage over weight training of heightening cardiovascular endurance as well as strength.

The ability to benefit from exercise differs for individuals.

JUNIOR The concept of individual differences helps one to understand why not all persons achieve the same level of performance when engaged in a standard training program.

All members of a group are not expected to attain the same performance level.

The concept of individual differences helps one to understand why outstanding athletic performances are attained by a relatively small number of persons with highly efficient body mechanisms.

SENIOR Because of differences in the fat content of muscles, individuals may be exposed to differing loads while performing a standard amount of work.

Because of differences in the lengths of force arms and resistance arms in muscle-bone leverage, individuals may be exposed to differing loads while performing a standard amount of work.

MUSCULAR ENDURANCE

Muscular work, performed repeatedly against an overload to the limit of one's ability and over a period of time, produces muscular endurance (the ability to continue muscular exertions of submaximal magnitude).

JUNIOR In most sports, performance falls off as one becomes fatigued. Muscular endurance is an important factor in delaying the onset of fatigue.

In preparing for participation in a sport, the participant should undergo training to develop the muscular endurance needed to sustain him in the activity.

SENIOR The development of endurance is determined by the following factors: size of the load on the muscles during training; rate of exercise; duration of exercise; nature of the activity; interval between bouts of activity; length of the training period; level of original endurance; and individual differences. Of these, the load on the muscles and the rate of motion are the most important.

Isotonic exercises are more effective in improving muscular endurance than are isometric exercises.

JUNIOR In selecting exercises to develop muscular endurance, the athlete should adjust the load of work so as to allow for repeated movements while maintaining as much of an overload as possible.

SENIOR Exercises of endurance increase the number of capillaries in the muscle thereby providing improved blood circulation to sustain the repeated contractions. The greater restriction of blood circulation during isometric exercise retards the development of muscular endurance during these exercises. Isometric exercises are very useful in strengthening muscles, but they must be supplemented with isotonic exercises if muscular endurance is also desired. The differences in results between these two types of exercises must be fully understood before the most appropriate choice of exercises can be made.

Endurance exercises produce gains in endurance which are proportionately larger than the gain in muscle size.

SENIOR There is evidence that endurance training improves the quality of muscle contraction and that muscular endurance is dependent more upon this quality than upon increase in size of muscle.

It is believed that the improvement in quality is associated with an actual chemical change by which (a) fuel is made more available, (b) fuel is stored in greater amount, and (c) oxygen is more abundant, owing to a more adequate circulation of blood through muscle. Since training for endurance causes an increase in the number of muscle capillaries, (a) and (c) are more important than (b).

It would be a misconception to believe that one must have bulky muscles in order to perform acts of endurance. Persons who hold this belief might exercise against so much resistance that they would be unable to perform enough repetitions to develop the endurance they sought.

Knowing the difference between the requirements for muscular strength and muscular endurance permits a person to choose exercises most appropriate to his conditioning objectives. For example, for muscular endurance, the exercises should be performed repeatedly against as much resistance as possible, but not so much as to cause exhaustion after relatively few repetitions.

Training can increase muscular endurance by improving neuromuscular coordination.

JUNIOR Training improves the precision and economy of action involved in muscular activity. Unnecessary movements are progressively eliminated and the activity is thereby performed more efficiently.

As efficiency improves, the energy expended for a movement is decreased and the movement can be performed for longer periods of time before fatigue sets in.

Training for muscular endurance in sports is a matter of improving coordination as well as developing the muscles.

In training for a sport, the participant should perform conditioning exercises in addition to practicing the sport, rather than in place of some of that practice.

Training can increase muscular endurance by improving the transmission of the nerve impulse to the motor units.

SENIOR Training is believed to improve the transmission of the nerve impulse at such locations as the motor end plates in the muscle fibers, in the synaptic junctions in the spinal cord, and in the cerebellum.

Evidence suggests that under competitive stress, the exhaustion of the nervous system is a limiting factor in performance. Therefore, improvement in the functioning of the nervous system would contribute to the development of muscular endurance.

Because of the specificity of neurological adjustment to each athletic event, improvement in the transmission of nerve impulses will be more likely to occur when one is practicing the activity itself than when performing special exercises. Therefore, insofar as nerve impulses are concerned, actual performance of the event is the best way to train for it.

Training can increase muscular endurance by improving a person's ability to economize in setting the pace for his activity.

JUNIOR Two persons who have equal amounts of muscular endurance may be unequal in their ability to sustain themselves in an athletic event. The ability to determine how much effort should be expended in performing the activity may cause one person to outlast the other.

Coaches should teach the principles of pacing in athletics, and give the athletes ample chance to practice pacing techniques.

SENIOR The most economical distribution of effort over a distance is obtained by performing at a constant rate over the entire distance. Acceleration and deceleration of effort are costly.

The ability to choose an optimum pace will enable a person to perform more efficiently, thereby delaying the onset of fatigue.

Circulatory-respiratory endurance is the ability of the circulatory-respiratory systems to adjust to moderate contractions of large muscle groups for relatively long periods of time. Exercises that improve total body action such as running, jumping, climbing, and swimming improve the circulatory-respiratory functioning of the body and thereby increase a person's ability to sustain effort in these kinds of activities.

JUNIOR Circulatory-respiratory endurance results when improved circulation due to training makes a fuel more available and increases the supply of oxygen to the tissues.

Cardiorespiratory endurance enables the athlete to sustain the high levels of energy expenditure which are necessary in vigorous sports such as swimming, distance running, skiing, and football.

Athletes whose sport requires cardiorespiratory endurance should undergo at least six weeks of intensive training prior to the start of the athletic program.

SENIOR Circulatory-respiratory endurance is dependent on the supply of oxygen and footstuffs to the working cells and on the removal of waste therefrom. These processes are affected by the blood capillary flow to the cells, the pumping capacity of the heart, and the permeability of the alveolar epithelium to the transfer of gases.

At least four separate types of training may be necessary to induce the favorable physiological changes required to develop maximum circulatory-respiratory endurance: • Short bursts of activity at maximum intensity to induce anaerobic function. • Continuous strenuous effort in which exhaustion is reached in about two minutes to improve the oxygen utilization systems. • Hard work of about eight minutes' duration to induce adaptation in the temperature regulating mechanisms. • Repeated practice of the event to promote a more precise coordination of movement.

Exercises of circulatory-respiratory endurance have little effect upon the size of the skeletal muscles.

JUNIOR One should not be misled into believing that all strenuous activities which produce exhaustion are muscle builders. An activity can be strenuous and place a heavy demand upon the heart and circulation without requiring muscular contractions of high intensity.

A person should carefully review his fitness objectives before planning his exercise program. For example, if he wants to develop circulatory-respiratory endurance and also build muscles, he should either perform total-body activities against increased levels of resistance or perform both high resistance exercises and total-building exercise.

SENIOR Most total-body activities do not demand the muscular exertion against high levels of resistance that are required to produce muscle hypertrophy.

Both interval training and circuit training are useful in developing circulatory-respiratory endurance.

JUNIOR The principle of circuit training for circulatory-respiratory endurance is the same as explained for improving strength.

Interval training, which is used primarily in track events, provides for alternating fast performance with intervals of slower performance. The slow action permits recovery before the next fast lap. Progression in endurance can be controlled by increasing the speed and distance of the last lap, shortening the intervals of the recovery laps, and adding repetitions to the program.

The advantages of circuit training for circulatory-respiratory endurance are the same as those explained for developing strength.

Interval training provides a convenient method of controlling progression in work load. This kind of training has the advantage of adhering to the principles of specificity (the exercise is the activity being trained for), rhythm, and pace.

Either circuit or interval training may be used by athletic teams, depending upon the sport for which the training is needed.

EFFECTIVE UTILIZATION OF CAPACITY FOR SKILLS

DEVELOPMENT OF POSTURE

Proper alignment of body segments provides for counterbalancing of body parts.

JUNIOR The adult spine is aligned in compensatory curves.

Proper alignment by counterbalancing saves muscular effort.

One can avoid fatigue by standing or working over a good base with the body supported in good alignment of successive segments.

SENIOR The effectiveness of a part in counterbalancing is dependent upon the mass and distance from the gravital plane of balance.

Displaced parts produce a rotatory effect which disturbs balance.

Repeated experience in work positions develops habits and sensations on which the posture is apt to be repeated.

ELEMENTARY Bad habits can lead to added strain; good habits help conserve energy.

One should strive to maintain good alignment at work or play.

SENIOR Maintenance of good posture is dependent upon kinesthetic awareness of position and is apt to be repeated.

Movement patterns are established as kinesthetic sensation - response sequences.

Proper alignment of body segments reduces joint strain.

JUNIOR Joint strain can be painful, inhibits movement, and may lead to more serious injuries.

One should attempt to prevent joint strain and injury by maintaining good alignment.

One should aid recovery following joint strain by care in maintaining segments in optimum alignment.

Optimum alignment of segments is that in which there is the minimum of rotatory movement at the base or articulations, thereby minimizing ligamentous and muscular strain.

Strength of antigravity muscles is important to good posture.

JUNIOR An erect body position can be maintained only by effort against the pull of gravity.

Inadequate strength of antigravity muscles results in progressively poorer posture and muscular and joint strain.

One should be alert to the appearance of slumping and feelings of muscular and joint strain in order to identify early inadequacies of muscular strength and correct them.

SENIOR There is a moment of rotation at all the articulations of the lower extremities and spine due to pull of gravity and joint structure.

Inadequate effort from antigravity muscles permits the spine to sag into exaggerated, compensatory curves, referred to as a "fatigue slump."

Since one is in an upright position for a large part of every day, endurance and strength should be developed in the antigravity or extensor muscles.

The basic skill elements of accuracy, coordination, speed, balance, agility, flexibility, rhythm, and timing can be developed by participating in a variety of physical activities.

ELEMENTARY The basic skill elements are best developed through activities which involve their use.

Physical activity through gross motor movements helps develop the fundamental skills of running, jumping, throwing, etc.

ELEMENTARY The fundamental skills are executed in a variety of games and sports, but can be practiced as fundamental skills outside of the game or sport situation.

Practice and improvement in the fundamental skills improve one's general motor abilities.

Improvement of general motor ability through the practice of fundamental skills increases one's capability for learning games and sports.

A person can not expect to become proficient in games and sports without being physically active.

ELEMENTARY An understanding of the mechanics and strategy of a game or sport cannot substitute for practice in the activity in which one strives for successful performance.

Generally, satisfaction from sports participation increases with proficiency.

Usually the ultimate satisfaction that comes from sports proficiency more than justifies the early frustrations that occur when learning the activity.

DEVELOPMENT OF RELAXATION

Differential relaxation is an aid in acquiring optimum coordination.

JUNIOR Beginners performance is characterized by tension, awkwardness, and fatigue.

Good coordination is possible only as the tension is relieved.

SENIOR Tension in antagonistic muscles makes effort more costly and action less smooth or free.

Tension in synergistic muscles may interfere with control and accuracy.

Tension in all muscles of an area interferes with perception of effort and degree of uniformity or variation in repeated movements.

Initial teaching-learning steps should aim for a general movement pattern inducing relaxation rather than a high degree of precision which induces tension.

The ability to exhibit differential relaxation improves with practice.

JUNIOR Relaxation must be practiced to become a part of a coordination.

SENIOR Muscles not involved in a movement can relax without interfering with the performance.

Relaxation of muscles not involved in a movement may improve the ease and coordination of the movement.

Precision in amount and timing of effort is a means of conserving energy and delaying fatigue.

Relaxation can not be complete, therefore proper timing and sequence is important.

Relaxation is a motor skill, just as a complex movement pattern is a skill to be learned.

JUNIOR Relaxation conserves energy and makes better coordination.

Practice should aim for development of appropriate relaxation as well as precision in outcome of the movement.

SENIOR Both motor contraction and inhibition of tonus and contraction are dependent upon patterns of nervous stimulation.

One perceives effort and relaxation through kinesthetic experience or action in which awareness is cultivated.

Perception and control must be learned by doing.

Voluntary and differential relaxation can be a form of release after many kinds of stress.

ELEMENTARY One should plan the day's routine to permit short intervals of relaxation and change of pace.

SENIOR A change in attention and focus of effort produces a change in stimulation and may reduce tension.

Voluntary relaxation can relieve the fatigue of prolonged tension.

Most modern living builds up stress and tensions; the individual must learn the techniques of relieving tensions.

EFFECTIVE SOCIAL BEHAVIOR

Rules for a game are designed to structure the game so everyone knows the terms of play.

ELEMENTARY Rules specify what may be done to work toward scoring and what may not be done to prevent opponents from scoring.

Rules provide equal opportunity for success and enjoyment.

Rules promote safety for players.
One should learn the rules and play by them.

Rules specify what may not be done to inhibit opponents.

Officials should apply the rules firmly and fairly.

Acquisition of appropriate skills makes it easier to conform to rules.

Learning to observe rules develops a restraint on inconsiderate and unfair behavior.

ELEMENTARY Players and opponents enjoy the game more when rules are observed.

Sports provide an opportunity for the individual to learn what constitutes respect and fair play with regard to others.

JUNIOR Respect for and observance of rules is a form of self-discipline.
Observance of rules is a desirable social reaction.

Practicing conformity to rules makes one more prone to play fairly in the future.

RESPECT FOR OFFICIALS

Respect for and acceptance of the authority of officials is based on trust and confidence in the official.

ELEMENTARY Accurate application of the rules by officials merits the respect of players.

The right to make decisions governing a game tends to provide a new dimension to interpersonal relations.

JUNIOR Personal likes and dislikes must not color one's acceptance of the official's authority.

Acceptance of the decisions of officials will tend to develop the ability to look objectively at restraints and opposing points of view.

The presence of officials is essential to success and satisfaction of players.

Respect for an observance of rules is a mode of social behavior.

ELEMENTARY Respect for rules and officials is an acceptance of a standard of behavior conducive to group living.

A group expects its members to be understanding and cooperative.

Observance of rules is an acquiescence to authority.

JUNIOR Every group must have rules and codes of behavior which are accepted by its members.

SENIOR When a standard of behavior is well established, it serves as a guide in other situations involving interpersonal relations.

Authority takes different forms in different situations, but experience in accepting authority reinforces one's ability to accept other forms of authority.

A group develops its standards and mores of behavior in play and work.

ELEMENTARY Society expects the individual to play by the rules.

Games and sports are a proving ground in which socially acceptable behavior may be practiced.

Society recognizes skill and ability as assets possessed in varying amounts by its members.

JUNIOR In order to be compatible in a group, one should know the standards of the group and the reasons for them.

Vigorous competition in sports can expend energy which might otherwise take socially undesirable forms.

Group interaction molds personality.

SENIOR Society accepts competition in vigorous sports as a healthy outlet for physical and mental assertion of self.

Society has a responsiblity for training its young in its standards and mores.

The standards and culture of a group help to mold the philosophy and behavior of the individual members.

SPORTSMANSHIP

Sportsmanship evolves as an expression of the understanding of the feelings and the rights of others, and is acquired through experience.

ELEMENTARY

Good sportsmanship stems from respect for the other person.

Poor sportsmanship is a selfish inconsiderate response.

Members of a group are mature when there is mutual respect within the group.

Good sportsmanship helps develop group morale.

JUNIOR

Good sportsmanship helps the individual develop an identification with the group.

A group whose members practice good sportsmanship is a happier, more cohesive group.

One's reputation as a good or poor sport influences the esteem in which he is held by others.

CONCOMITANT LEARNINGS

A competitive spirit develops as a basic part of group interaction in play and in use of motor skills.

ELEMENTARY

Competition in sports provides a situation where one attempts to excel under stress without taking unfair advantage of the other person.

Competition provides a challenge to the individual.

JUNIOR

Competition is a means of self evaluation and motivation to achieve one's best.

Competition exists throughout everyday adult life as well as in play activities.

Deserved recognition of skill or other assets is a symbol of status or prestige.

ELEMENTARY

Individuals may gain status and self-confidence by achievement of skills.

In a culture in which sports are important, skill becomes a valuable asset.

Excellence in physical skills is recognized in our culture.

Playing in sports and games provides a basis for an understanding of the abilities and contributions of others for the group effort as well as for personal satisfaction.

ELEMENTARY

Play provides a basis for cooperation, a setting in which to help others.

Play challenges the player to put forth his best efforts for the common good.

Play leads to an appreciation of those with whom one plays.

Cooperation should be one of the goals of games and team sports.

SELF-REALIZATION AND DEVELOPMENT OF CULTURAL, AESTHETIC, AND ARTISTIC VALUES

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INDIVIDUAL REGARD FOR SELF

Through physical education one can become aware of one's limitations and capacities.

ELEMENTARY

A program of physical education provides experiences that can clarify concepts of success and failure.

Physical education activities furnish a yardstick against which one can compare oneself with others.

For some individuals, recognition of capacities is best accomplished through physical activity.

The greater the variety and extent of activity in which one participates, the greater the understanding of self-limitations and capacities is apt to be.

JUNIOR

Understanding of self can limit or extend the learning of skills.

Regard for self can be influenced positively through participation in physical activities.

ELEMENTARY

Physical activities provide opportunities for the individual to strengthen his positive feelings about himself.

For some individuals, positive regard for self may best be accomplished through participation in physical activity.

Satisfaction from physical education programs can occur when the individual is allowed to progress at his own rate through experiences constructed to allow for individual differences in ability and interest.

REASON AND INTELLIGENCE

Participation in physical activity enables one to more nearly realize one's potential for reason and intelligence.

ELEMENTARY Physical activity provides situations for learning by doing.

Physical education programs can provide opportunities which enable the student to use his abilities in the solution of problems.

Physical education provides opportunities for self-direction and intrinsic motivation which stimulate learning.

JUNIOR The more varied and complicated the activity situation, the greater the opportunity to develop reason and intelligence and the ability to make valid judgments.

INITIATIVE, COURAGE, AND PERSEVERANCE

Physical education experiences help to develop initiative, courage, perseverance, and ambition.

ELEMENTARY Situations involving challenge, self-testing, struggle, etc., can be part of the physical education program for all participants.

Situations involving risk, challenge, and self-testing encourage the development of initiative, courage, perseverance, and ambition.

Character traits developed and expressed in athletic situations can be transferred to other aspects of life.

UNDERSTANDING OF PHYSICAL ENVIRONMENT

Participation in physical activity increases knowledge and understanding of the physical environment.

ELEMENTARY Because physical activities are governed by principles of mechanics, the concepts of time, force, distance, direction, etc., are increased and refined through participation in physical activity.

The sharpening of judgment of speed and distance which results from participation in various physical activities may help one to respond more effectively in emergencies.

CULTURAL VALUES

Physical education experiences help students understand dance, games, sports, and athletic programs which are a part of their and other cultures.

ELEMENTARY The more one participates in the various physical activity programs of a culture, the more at home he is in the culture.

Physical education is one medium by which education achieves its responsibility to perpetuate society's culture.

If the selection of activities includes activities of other cultures, physical education can be used as an instrument of intercultural understanding.

In all human societies, rituals, festivals, dance, sports, and games are among the activities that provide outlets for creativity and reinforce national feelings.

JUNIOR The areas of dance, games, sports, and athletics are used to attain national and international goals and to promote greater understanding among people.

AESTHETIC AND ARTISTIC VALUES

Movement education extends the range of nonverbal expression and communication.

ELEMENTARY The abundant opportunities in physical activity for using the various senses help to develop nonverbal communication. The development of nonverbal communication through physical activity is valuable for both intellectual and creative development.

Movement education enriches life by increasing the realm of artistic and aesthetic satisfaction.

The physical education program can provide opportunities for development of creativity.

Aesthetic and artistic experiences in physical activity bring satisfaction and pleasure.

A participant in physical activity is both the creator and consumer, the composer and audience, and is thus engaged in both an artistic and aesthetic experience.

JUNIOR The enrichment of life through physical activity is an important aspect of advancing a culture.

Man's desire and need for enrichment of communication and expression, both intellectual and emotional, have led to the development of artistic expression through physical activity.

Part III / MODIFYING FACTORS

FACTORS MODIFYING PARTICIPATION IN ACTIVITIES AND THE EFFECTS OF PARTICIPATION

AGE AND MATURATION

Growth patterns are irregular from child to child.

ELEMENTARY At any given age there is considerable range in height, weight, physical maturity, and performance in skill movements.

Variations in individual growth characteristics will cause great ranges of normal performance from child to child. Standards of performance have a wide range depending upon the age, height, weight, strength, and performance ability of the child.

Activities should be selected according to kinds and levels of skill needed.

JUNIOR A child may biologically be several years older than another child of the same chronological age.

One of the least valid measures of biological age or maturity is chronological age.

ELEMENTARY Most early schooling is based upon chronological age, so that within a class or grade biological age may vary several years.

The stages of maturation are guides in equalizing teams for participation and competition.

The difference between biological age and chronological age is significant in terms of motor development.

SENIOR "Skeletal age," as determined by wrist x-ray to indicate the state of ossification, is probably the most valid index of biological development.

Most prepubescent children are not as tall, as heavy, or as strong as pubescent children.

ELEMENTARY Strength development tends to parallel sexual maturity, with marked changes in height, weight, and strength following pubescence.

Activities should be selected in terms of their difficulty, duration, intensity, frequency, amount of body contact, needed strength, and interest.

Girls tend to reach pubescence about one to two years earlier than do boys.

JUNIOR During this period, girls tend to be heavier and taller than boys of the same age.

This earlier maturity tends to place girls in an advantageous position over boys of the same age, in terms of strength, endurance, height, and weight.

Activities should be selected properly in terms of individual differences.

Boys may be behind girls in social and emotional development until after puberty, and this will affect activity participation.

SENIOR Strength in boys increases to reach a maximum between the ages of 20 and 29 years.

In girls, strength increases to a maximum by puberty. Activities for coeducational physical education programs are selected with these strength facts in mind.

Children experience growth spurts, during which times posture problems or deviations may develop.

ELEMENTARY Rates of growth in the various body organs and structures are not uniform.

JUNIOR Correction of postural defects frequently depends on increased strength of the weaker muscles.

The uneven rates of growth can cause self-concepts leading to postural attitudes and also physical stresses. Activities should be selected in terms of the variety of body movements involved, in relation to strength, endurance, body contact, and performance level.

Maturation involves emotional, social, and mental developmental overtones.

JUNIOR Strength, flexibility, endurance, height, weight, and readiness for certain kinds of activity determine which activities should be chosen and how they should be modified.

In activities, children are assisted in understanding some of the reasons for their actions as related to their levels of maturity.

SENIOR Lack of performance skills at certain ages or levels of maturity may cause emotional and/or social adjustment problems.

During the years of growth, performance capacity improves.

ELEMENTARY For performance to improve, strength, endurance, ability, and skill must be developed.

With increased maturity come increased strength, endurance, flexibility, height, weight, and ability to use the body as a means of expression.

JUNIOR As performance improves with age and maturation, it is essential that activities and skills be selected in keeping with growth and development.

Children who excel in sports, as compared with others their age, are usually one to four years biologically advanced.

Many complicated sports activities which are learned with great difficulty at one stage of growth may be learned quite easily at a later level of maturity.

JUNIOR Generally speaking, strength and endurance increases with maturity.

With maturity, fatigue factors in learning skills tend to decrease.

Economy of time and energy are dependent upon readiness to learn skills.

SENIOR The level of maturity should aid in the selection of new and complex motor learning experiences.

ATTITUDES

Rules in games are necessary to prevent misunderstandings, disagreements, and injuries, and for the general welfare of the players.

ELEMENTARY If the group makes certain rules, each player should play by these rules even if he could win or play better by not following them.

Players should follow the directions of whomever has been chosen or appointed as the leader or official; they should be able to question any decisions they do not understand, but should not complain because they do not agree with the decision or the game results.

Wholesome attitudes toward group procedures and official decisions will make a more effective performer, and the effects of participation will be more beneficial.

JUNIOR The attitude toward authority may enhance or impair performance in a physical activity and the effect of that activity on the individual.

For best performance, an individual must have an accurate self-image of his abilities in relation to those of others.

ELEMENTARY Bodily movement is a means of expression and communication; it can aid a person in attaining an accurate self-image, and in understanding others.

Believing that physical activity is beneficial can improve performance and increase the desirable effects of activity on the physical, social, and emotional components of fitness.

The individual's concept of self, his body, and his ability to move are all factors which affect his ability to perform physical activities.

In order to gain the most benefit from participation in physical activities, there should be respect for the psychological and physical differences in people. Players should behave in ways that will aid their own development and self-understanding, and awaken an understanding of the well-being of others.

Sportsmanship means being considerate of others, their rights, ideas, and opinions in competitive situations; it means accepting success and failure with equal ability and grace.

ELEMENTARY Whenever there is competition between two teams or individuals, one must win and one must lose, or they tie; the winner should be modest and the loser should accept his defeat gracefully.

To obtain the greatest values from participation in physical activities, the rules of sportsmanship should be applied to every situation.

JUNIOR There is an interaction between the moral values of society and the values that accompany competitive sports activities.

Satisfying experiences in participation in physical activities usually result in favorable attitudes toward physical activity; these enhance performance.

ELEMENTARY Individuals should always play their best and try to improve their performance whether playing on a team or alone.

A person performing to the best of his ability, whether winning or losing, will derive benefit from this performance.

One way to improve physical skills is to experiment with different ways of performing them.

ELEMENTARY A willingness to experiment can help to improve the performance of skills. Being able to evaluate performance helps a person to understand himself and his capacities; experimentation aids in evaluation.

To improve in skill, analyze self-performance and that of others; then try new ways of performing and of correcting mistakes.

Learning and applying the basic principles of movement skills enables a person to improve skills and learn new ones, even without the direct assistance of a teacher.

Physical activities provide opportunities to develop individual creativity, and exercising creativity will often improve performance.

Proficiency in a skill requires purposeful practice and perseverance to keep trying until some degree of success is attained.

ELEMENTARY An unsuccessful performer should not make excuses; instead, he should try to determine why he has failed, and then try to perform the skill correctly the next time.

JUNIOR Each person should set his own goal for performance in each activity, check his own progress, and set new goals as old ones are met. Individual abilities and limitations should be assessed carefully.

If a performer has a strong enough desire to achieve a certain skill, he will persevere until he derives sufficient satisfaction in it.

Attitudes toward activity and perseverance in the practice of physical skills have strong influences on how this participation will affect social behavior, the realization of physical potentials, and the development of values.

The attitude toward the group in which one is participating can affect his performance and the values he will derive from an activity.

ELEMENTARY When playing in a large group, a person sometimes has to play in a position that he dislikes, for the good of the group; this will, in the long run, benefit his own performance of skills.

In all physical activity, individuals should work toward raising the level of performance of the entire group, and realize the effect of improved group action on each individual's performance.

JUNIOR Team and group activities help to develop the sense of individual and group responsibility.

Group activity requires cooperation on the part of members of the group and subordination of individual desires to those of the group.

In all forms of physical activity an individual can enhance or impair the progress of the group, and vice versa, depending on the interrelationships among individuals in the group; group action is the basis of an efficient democratic atmosphere in physical activity situations.

Safety regulations are established for the well-being of all participants and for their successful performance.

ELEMENTARY Knowing safety rules and applying them is essential to the safety and enjoyment of everyone involved in the activity.

When beginning a new type of physical activity, the participant must learn the safety rules and precautions necessary for safe, enjoyable, and efficient participation.

Awareness of safety precautions and a willingness to heed them can improve performance and enable the performer to avoid injury.

Playing with a desire to win will usually improve performance.

ELEMENTARY Losing a well played game is no disgrace.

One well skilled individual cannot win a team game by himself; to be the most effective, he needs to help and be helped by all members of the team.

If the desire to win is controlled by observance of rules and consideration for the welfare of others, this desire can enhance the performance of sports skills.

Along with a desire to win, the player needs to develop cooperation and consideration of others to be an effective performer in competitive situations.

The attitude toward fatigue can impair or enhance a person's physical performance and the effects of activity on his body.

ELEMENTARY Performing when overly fatigued can be detrimental to performance and health, because of the increased possibilities of injury.

Every individual must be concerned about his own safety and well-being, but an overconcern may keep him from trying new activities.

JUNIOR If a performer understands how much fatigue his body can tolerate safely, he can develop increasing amounts of endurance by pushing himself beyond the first sensation of fatigue.

For optimum performance of physical activities and the best effects of these on overall fitness, an individual must learn what amount of fatigue can be safely tolerated or ignored, and when he should cease activity because of fatigue.

Strength, endurance, and skill in physical activity are developed by steadily increasing amounts of work which gradually extend the period before fatigue inhibits performance.

Fear of injury from falls, body contact, or flying objects can be a great deterrent to the learning of new motor skills.

ELEMENTARY Undue fear of injury while performing physical activities must be eliminated in order for the greatest learning and progress to take place, as well as for the greatest possible enjoyment of the activity.

The possibility of injury in physical activity can be eliminated or minimized through the learning of proper mechanics in performing skills and through proper progression, under suitable supervision.

A person with a well coordinated body, who has learned the skills involved in diving and jumping from heights, and in performing on high apparatus, can enjoy and safely participate in these types of activities with little chance of injury.

A feeling of inferiority or inadequacy can retard the learning of physical skills and lessen the beneficial effects of performing these skills.

ELEMENTARY Every individual, regardless of physical condition and existence or lack of physical defects, can achieve some degree of success in some forms of physical activity.

A feeling of inferiority or inadequacy can be eliminated by a series of successes in progressively more difficult physical activities.

One way to reduce a feeling of inferiority, inadequacy, or insecurity is to seek successful performance in at least one physical skill; then build on that with the help of a teacher or other skilled performer.

JUNIOR The body, maintained at maximum working capacity, can work efficiently at many tasks with freedom from fear of failure.

Some individuals are afraid to play games because of a fear of losing.

ELEMENTARY In every game, some must lose while others win; if a player tries his best, he probably will be a winner some of the time, but he need not be ashamed of losing to a better opponent.

To overcome undue fear of defeat, players should try to gain more confidence by learning the appropriate skills in proper progression and under good guidance, practicing hard, and choosing opponents close to their own level of skill.

Undue fear of water, beyond a healthy respect for the dangers involved, can be detrimental when a person is learning to swim.

ELEMENTARY In a safe and protected environment, under the leadership of a competent instructor, the learner must place his confidence in the instructor and trust the supportive power of the water.

Excessive fear of water may make it difficult for a learner trying to achieve swimming skills, for this creates unnecessary tensions which work against the relaxation requisite to ease in swimming.

In our present culture, boys usually surpass girls in the knowledge of rules and strategies associated with the traditional American sports and in skill in these sports.

JUNIOR Because the traditional American sports are dominated by men, the resulting cultural pressure causes boys to be more interested in these sports than are girls; to have more out-of-school experience in these sports than do girls; and consequently to surpass girls in sports knowledge and skill.

SENIOR Students should recognize the social pressures that may motivate them to participate in and become knowledgeable and proficient in various activities.

In our present culture, girls usually surpass boys in skill in rhythmical activities.

JUNIOR Because graceful movement is considered a desirable attribute in women, girls are more interested in rhythmical activities than are boys and surpass boys in such activities.

In general, the overt reactions of girls to highly competitive situations in sports have been different from the reactions of boys.

JUNIOR Differences in the overt reactions of boys and girls to competitive situations are largely a result of cultural pressure rather than physiologcal differences. Currently changing attitudes toward competition for girls and increased emphasis upon such activities may result in changes in the overt reactions of girls to competitive situations.

Knowing that overt reactions are learned, and thus are subject to control, one can evaluate and modify one's behavior in competitive situations, and understand the behavior of others.

Knowing how sex differences may influence behavior enables one to develop basic principles for guiding one's actions in competitive situations.

At age 15 and after, boys on the average surpass girls in strength, speed, endurance, height, and weight; and girls on the average exceed boys in flexibility. Those differences determine to a considerable degree the activities in which each sex may successfully and/or appropriately participate.

JUNIOR For such activities as football, basketball, volleyball, softball, baseball, and track and field athletics, strength, speed, endurance, height, and/or weight are requisites for successful performance. For these reasons, rules are sometimes different for boys and girls, or are modified for younger players.

For such activities as dance, gymnastics, and diving, graceful movement and coordination are requisite for success.

Height and weight may often be used advantageously in activities in which objects other than one's own body are to be manipulated. On the other hand, height and weight often serve to handicap the performer in activities in which his body must be manipulated in space.

Knowing that successful performance in specific activities requires that the participant have specific attributes assists boys and girls in selecting appropriate activities.

Students should know the attributes required for success in the various physical activities to identify those activities in which they can expect to achieve a reasonable degree of success.

From about the age of 14, girls tend to lose interest in sports and as a consequence fail to improve in physical performance as rapidly as do boys.

JUNIOR In sports for which strength, endurance, and size are not prominent requisites to successful performance, girls are capable of developing as much skill as are boys.

At about grade 9, cultural pressure causes many girls to lose interest in team sports, and hence to participate in them less and less as time goes on. Because continued participation in sports is necessary for improvement in skill, the rate at which girls acquire skill declines. Boys continue to participate in sports and consequently continue improving their skills.

Girls who are aware of the cause of decline in their rate of improvement in sports skills can act to prevent this decline and can steadily improve in skill, if they so desire.

Girls should continue to participate in wisely selected activities and thereby improve their skills in numerous appropriate sports.

Sports and games in which boys and girls develop knowledge and skill should include some in which they can participate together on an equitable basis.

SENIOR As parents, both husband and wife have important roles to play in planning and carrying out a physical recreation program for the family. Their cooperative efforts will be more effective than single efforts.

Students should identify and develop skill in those activities in which boys and girls (as well as men and women) may satisfactorily participate together.

Oxygen deprivation at high altitudes reduces exercise tolerance.

JUNIOR At high altitudes the air is less saturated with oxygen.

Muscular exercise at high altitudes may result in shortness of breath.

The intensity and duration of exercise should be reduced when changing from low elevation to high altitude.

The same type of performance sustained at low elevation cannot be expected at high altitudes until the body has had time to adjust.

SENIOR The rare atmosphere at high altitudes is liable to place an undue strain on the heart of an injudiciously active person, since the heart must work harder than at lower elevation.

At high altitudes, oxygen debt is accumulated quickly, and recovery rate is retarded.

The temperature of the air can affect performance in physical activities.

ELEMENTARY The duration and intensity of exercise during extremely hot weather should be reduced, especially in the sun, during the hottest part of the day.

JUNIOR As the temperature of the air rises, exercise places a greater load on the body, due to greater difficulty in regulating the temperature of the body through circulation, respiration, and perspiration.

The sun's rays may have a deleterious effect on the skin and eyes.

ELEMENTARY

Because of the position of the sun's rays, prolonged strenuous outdoor activity should be avoided in the middle of the day during the summer months.

Overexposure to the sun can be a painful or even dangerous hazard to the skin and eyes.

Overexposure to the sun should be avoided by reducing duration of activity and wearing appropriate clothing.

During outdoor physical activity, a severe sunburn may result without the participant being conscious of the sun's burning effects.

Sun glare may have a detrimental effect on vision during physical activity.

Ultraviolet rays, present even on overcast days, do not produce a sensation of warmth even when they are causing a severe burn.

JUNIOR

Dark glasses may need to be worn during activity to prevent damage to the eyes from the sun and to ensure better vision.

The environmental factors of importance in the control of body temperature during exercise are the atmospheric temperature and air movement.

JUNIOR

Frequency and depth of breathing during exercise increase with a rapid rise in body temperature.

During strenuous exercise, loose, lightweight clothing should be worn to permit evaporation to proceed effectively and to protect against further absorption and radiation of heat.

Clothing of loosely woven material which permits freer ventilation should be worn for exercise in hot weather.

Maximum ability to perform strenuous exercise in hot weather is attained by progressively increasing workouts in the heat.

SENIOR

The regulation of thermal balance in the body during exercise is aided by heat loss.

Loss of body heat occurs through expired air, evaporation of sweat, conduction, convection, and radiation; this loss is increased during exercise.

Heat loss during exercise can be heightened by increasing the movement of the air around the body.

Humidity has a marked effect upon ability to perform prolonged exercise in the heat.

ELEMENTARY

The best performance of a sport in hot, humid weather is obtained when the water lost in sweat is replaced regularly by drinking water.

Thirst is a lagging guide to the body's need for salt and water lost through exercise.

JUNIOR

During exercise the body will not retain water unless there is an adequate supply of salt in the body.

Replacement of water and salt is essential for effective performance in humid heat.

High humidity materially reduces perspiration and, if accompanied by air temperature in excess of body temperature, may lead to heat stroke during vigorous exercise.

In order that high humidity will not have a detrimental effect on the performance of physical activity, the body must have an opportunity to adjust to the humidity.

SENIOR

When sweating occurs (and this increases during activity in high humidity), quantities of salt are lost from the body; this may result in the development of cramps in the leg and abdominal muscles.

Heat cramps may be relieved or avoided by taking salt tablets prior to strenuous activity in humid heat.

Water temperature has an influence upon respiration, especially during exercise.

ELEMENTARY

Before entering the water, swimmers should check the temperature of the water.

Swimmers should let the body adjust gradually to cold water.

Warm water is better than cold for one who is just learning to swim.

Body tension increases in cold water, while warm water tends to relax the body.

JUNIOR

Diving into cold water usually causes a temporary arrest of respiration or an inspiratory phase and may result in a gasping type of respiration which will gradually become slower and more regular as one swims.

Playing surfaces vary with respect to smoothness, resiliency, traction, and reflection of light. These in turn influence performance of physical activities.

ELEMENTARY

There is less bounce or rebound of balls when the surface "gives."

Starting, stopping, changing speed, and changing direction are maneuvers which require a firm footing.

JUNIOR

Resiliency of the surface will influence the bounce or rebound of balls, as well as foot and leg fatigue and possibility of injury during activity.

Some surfaces will result in greater danger of slipping (for example, wet turf). Activities may have to be adapted for safe performance.

The contact between shoes and playing surfaces should usually produce a high coefficient of friction.

The use of spikes or heavy treads on shoes will lessen the chance of slipping during activity.

The respiratory and circulatory systems are affected by pressure changes in the environment, and even more so during exercise.

SENIOR

For participation in scuba diving, the principles of physics involved in going below the water's surface, and the resultant physiological changes, must be taken into consideration.

The basic laws applicable to depth diving are the laws of Boyle, Dalton, and Henry.

- Boyle's Law — An increase in pressure on a confined gas (in the lungs) results in a decrease in volume, and conversely.

- Dalton's Law — In a combination of gases, each gas (in the lungs) exerts its particular pressure independently, so that the total pressure is the sum of the partial pressure of the components.
- Henry's Law — The increase in pressure on a gas allows it to go into solution more easily. For example, nitrogen under greater pressure in deeper water is absorbed more easily into the blood stream.

A strong wind will have an influence on the speed, direction, and distance which an object will travel when thrown through the air.

JUNIOR When wind is involved the angle of release of a thrown object must be adjusted.

To gain maximum distance, it is necessary to project an object lower against a headwind and higher with a tailwind. The force of a tailwind is added to the force of a throw.

A headwind retards the forward progress of a thrown object and decreases the distance it travels.

The clothing worn may modify the ability of the performer and may alter the effects of the activity upon the individual.

ELEMENTARY Tight-fitting or bulky clothing impairs movement during activity, making one work harder and perspire more.

Dark-colored clothing will absorb more heat during activity and will tend to be warmer.

The skills of an individual in various physical activities should improve from grade level to grade level.

ELEMENTARY Improvement in skill is a function of maturation as well as a function of practice.

Knowing that skills improve from grade level to grade level should motivate the student to persist in his efforts to improve.

The student should measure his progress in the development of skill from grade level to grade level, and he should identify the reasons for progress or lack of it.

Individual differences in skill between students of the same age or grade level increase as age (grade) increases.

JUNIOR Individuals differ in the rate at which they acquire skill and in their capacities for reaching high levels of skill.

Knowing that the wide range of individual differences in skill between students of the same age (grade) is a natural phenomenon can help the student to accept his limitations without undue self-conflict and to be tolerant of the lack of skill in others.

SENIOR The student should compare his level of skill with the levels of skill of his classmates and analyze the reasons for the variations.

Rapid periods of growth often are accompanied by a temporary deceleration in the rate at which skill in handling the body is acquired; in individual cases, the student may suffer a temporary regression in skill.

JUNIOR During rapid periods of growth, the mechanical advantages of the various levers of the body may be markedly changed. The weight of the lever changes, as does the length, which changes the linear velocity at the end of the lever, even though the angular velocity remains unchanged. These changes often result in temporary losses in skill in performing activities in which the manipulation of the body in space is involved.

Since pronounced spurts in growth often are accompanied by a temporary deceleration in the rate of skill development, the rapidly growing student should not be needlessly discouraged in his efforts to improve his skills.

The rapidly growing student should observe the changes in his skill as they occur and should attempt to relate these changes to changes in body development.

The satisfaction gained from participation in an activity is, to a degree, related to skill in the activity.

ELEMENTARY For successful performance and subsequent satisfaction the learner should begin with activities that require simple skills and progress to activities that require increasingly complex skills.

Success in an activity is requisite to satisfactory participation; skill in an activity is requisite to successful performance.

JUNIOR Knowing that the enjoyment derived from participation in an activity is directly related to the level of skill of the participant, the unskilled performer should be motivated to improve in skill.

The skillful person expends less energy in performing various movements than does the unskilled person.

JUNIOR The skillful performer utilizes only the muscles required to perform the activity, in the proper sequence and in the proper amount. The unskilled performer utilizes many extraneous muscles and as a consequence expends more energy than does the skilled performer.

Knowing that the skillful person expends less energy in performing various movements than does the unskilled person, the student can understand his own inability or ability to match the physical performance of others in activities that require considerable endurance.

In participating in a given activity, the unskilled performer should not expect (or be expected) to match the performance of a skilled person.

The higher the level of skill acquired in a given activity, the more difficult further improvement in the skill becomes.

JUNIOR As the student approaches a high level of skill, he must practice even more diligently to obtain further improvement.

Knowing that improvement in skill becomes increasingly difficult as one approaches the limit of his capacity, the student should not become discouraged at his relatively slow progress as his skill increases.

SENIOR As the performance curve approaches the physiological limit, the curve becomes asymptotic in nature.

Skill in movement is related to safety; provided that sound judgment is exercised, the skillful person is less likely to be injured while participating in activity than is an unskilled person.

ELEMENTARY To avoid injury, the student should begin with activities that demand only a low level of skill and progress to those requiring higher levels of skill.

JUNIOR Because the unskilled person cannot completely control the direction and amount of force he exerts, he is often not able to control the movements of his body and is more easily injured.

Knowing the relationship between skill in an activity and the safety with which one can participate in the activity enables the student to reduce the probability of injury through wise selection of activities.

Physical condition is a quality over which the individual has considerable control.

ELEMENTARY A participant can develop or build up his physical condition status by proper training.

JUNIOR In order to protect his health and safety and to perform effectively in physical activities, the individual must assess his physical condition status accurately.

SENIOR Man's capacity for physical effort is affected by the following factors: • The amount of immediately available energy in the muscle, such as phosphocreatine and adenosintriphosphate • The amount of buffer in muscles and blood available for neutralizing the lactic acid formed when glycogen yields energy in the absence of oxygen • The ability of the lungs, heart, blood, and circulatory apparatus to capture and deliver oxygen to the active muscles, so that lactic acid may be oxidized or resynthesized to glycogen and thus spare the buffers.

Physical condition is generally considered to be primarily a physical matter, though social and emotional ramifications also exist.

JUNIOR One's physical condition status affects cardiac function, respiratory efficiency, strength, endurance, flexibility, muscle tone, and the ability to relax.

Failure to develop optimum physical condition may be due to social and emotional stresses.

Understanding the self is essential in developing an optimum state of physical condition.

Physical condition consists of a state of general health, as evaluated by a comprehensive medical examination, plus the status of strength, agility, endurance, and skill of movement.

JUNIOR Knowledge of one's health status and physical condition in terms of strength, agility, and endurance is essential to the determination of safe boundaries of effort expenditures.

SENIOR To evaluate physical condition the person must consider himself as a unitary being.

Temporary conditions or changes due to illness, accident, or convalescence will alter physical condition and modify activity participation.

ELEMENTARY Handicapping defects, illness, convalescence, and lack of regular activity will change physical condition status and performance.

JUNIOR Because certain activities require certain specific movements and degrees of condition, illness, injury, and physical handicaps must be carefully assessed in relation to activities attempted.

Activities selected for participation and the level of suitable competition will depend upon physical condition status.

SENIOR Tensions resulting from exaggerated muscular contractions, injury to muscles, hypertonicity from strenuous exercise, and excessive stretch reflexes affect participation and performance.

For the most part, physical condition is quite specific to the type of activity in which it has been developed.

JUNIOR The degree and specificity of condition are dependent upon the proficiency and level of performance desired, the effort put forth in training, and the type of activity to be performed.

Repetitions of particular movements in varying intensities will develop condition in those physical activities, but not necessarily in others.

Atypical manifestations resulting from growth and development, illness, and accidents must be accepted as limiting factors in physical condition.

JUNIOR Individuals possess differing levels of potential for condition for specific activities: body build, innate capacity for flexibility, coordination, circulation, and respiratory habits.

An individual cannot be expected to perform beyond his capacities, and in terms of his physical condition status.

Generally the training routine varies with the type of activity, the individual's potential, and the level of competition expected.

Capacity for physical effort may be increased by training and building up the physical condition status.

JUNIOR Sustained and all-out performance requires optimum physical condition.

Repeated exertions of maximum effort result in improved condition and performance.

Training makes it possible to overcome inhibitions due to lack of strength and endurance and to reduce the tensions involved in the effort of performing.

SENIOR With appropriate training the performer can learn to relax the unnecessary tensions which inhibit optimum performance.

Not a single death has ever been legitimately attributed to exercise or vigorous activity in a thoroughly healthy individual.

JUNIOR Each individual must assess his health status, his potentials, and his liabilities, and select or adjust his activity accordingly.

The level of physical condition or training is related to energy output, cardiovascular functioning, ability to relax, muscle tone, degree of tension, and respiratory efficiency.

In order to attain maximum activity performance levels, physical condition status must be brought up to the highest potential within the capacity of the individual.

Energy required to sustain physical activity is produced from carbohydrates, proteins, and fats.

ELEMENTARY Effective participation in vigorous play and strenuous physical activities depends upon the satisfaction of nutritional needs.

JUNIOR Caloric intake has a direct relationship to effective participation in vigorous physical activity.

Knowledge that adequate amounts of the basic food elements (protein, carbohydrates, fats, minerals, vitamins, and water) are essential for optimum performance in sports assists in dietary choices.

Salt, iron, and other minerals are necessary to heart and circulatory function.

ELEMENTARY Iron in the diet contributes to the ability of red blood cells to carry oxygen, and is thus important to endurance.

JUNIOR Red blood cells contain hemoglobin, an iron compound that can pick up more than half its own weight in oxygen; this oxygen is important to sustained physical activity.

There are no special foods that specifically improve athletic performance.

ELEMENTARY A reasonable, well-balanced diet is superior for physical activity to an unusual and unbalanced one.

JUNIOR Unusual diets including such items as nuts, seaweed, and blackstrap molasses have not been proven to affect sports participation in a positive manner.

The relationship of performance in sports to the use of special foods, diets, or enriched beverages should be continuously evaluated by research.

Insufficient or inadequate foods contribute to muscle weakness, soreness of muscles, reduction of speed, and loss of coordination.

ELEMENTARY Nutritional needs of athletes are essentially similar to those of nonathletes, except in amount of intake.

JUNIOR As growth and activity patterns change during adolescence, the student must make adjustments in diet to meet increased demands.

When little or no food has been eaten after dinner, the body needs food upon arising the next morning to establish a satisfactory energy level for activity.

SENIOR The student must understand caloric needs in relationship to personal activity and metabolic rate, and must plan his diet in this context.

Protein replaces tissue which is used up daily in activity.

ELEMENTARY Energy available for participation in sports is stored over a period of time and requires regular eating habits rather than special meals or foods immediately before competition.

Improved eating habits and better intake will help delay the onset of fatigue and will contribute to more satisfying physical activity.

JUNIOR Protein malnutrition is the most serious nutritional disease in the world today and is especially serious for an athlete. Proteins are burned in vigorous activity if adequate amounts of carbohydrates are not included in the diet.

Fatty foods are difficult to digest and may be detrimental to performance if consumed immediately prior to participation in vigorous activity.

ELEMENTARY Overeating and subsequent overweight will affect the kind of activities which can be the most satisfying.

JUNIOR Poor nutrition resulting in excessive weight gain adversely affects social behavior and social acceptance as these relate to participation in physical activies.

SENIOR Emotional factors may contribute to overeating and inadequate exercise, leading to obesity; nutrition which causes overweight tends to decrease activity.

Food provides fuel for physical activity.

ELEMENTARY Fuel from food is essential for muscular contractions.

JUNIOR Physical activity is made possible by energy derived from the oxidation of foods.

SENIOR The individual must measure his needs for a continuous supply of fuel for effective operation of the body, and additional fuel for vigorous activity.

A general, well-balanced diet selected wisely as to time and amount provides the energy for vigorous activity.

ELEMENTARY Each person should check his daily diet in terms of calories and other nutritional needs and compare it with medically recommended daily dietary needs for persons of his age and body build with similar activity requirements.

JUNIOR Proper concepts of one's dietary needs are necessary for a full and active life.

SENIOR Faulty nutrition reduces the favorable effects of physical activity on general health.

Vitamins are important food elements for developing endurance, maintaining energy, and sustaining general good health.

ELEMENTARY Vitamin D and calcium contribute to strong bones and repair of broken bones. With increased activity caloric needs become greater and the need for thiamine (vitamin B) increases.

JUNIOR Since vitamin A is related to effective night vision, athletes who perform at night should be exceptionally careful to include this vitamin in their diets.

Vitamins are related to other dietary elements and thus have wide nutritional significance for everyone, especially those engaging in vigorous activity.

FATIGUE

Fatigue is the diminished capacity for response that results from activity; the loss of function applies equally to physical, emotional, and mental activity.

JUNIOR Performance of individuals in large muscle activities is dependent upon the demands for strength, endurance, and physiological function to meet the needs of the activity.

Improvement of action of muscles, heart, circulation, and respiration will assist in carrying out more difficult activities of longer duration with less effort and less fatigue.

SENIOR During prolonged physical activity decreased glycogen stores and increased lactic acid cause discomfort, leading to diminishing responses.

In endurance events calling for vigorous activity, continued exertion may result in an excessive depletion of the glycogen reserves of the body; this may lead to hypoglycemia and the appearance of marked fatigue and exhaustion.

ELEMENTARY During prolonged physical activity a decrease in the glycogen stores is accompanied by an increase in the symptoms of fatigue; when sugar is eaten, these symptoms tend to disappear.

Glycogen is an energy yielding carbohydrate which is part of the stored fuel supply of the body.

JUNIOR When muscles tire during activity the difficulty may be in the muscles themselves or in the nervous system.

Short periods of activity alternated with rest periods will allow for greater output than will continuous participation. Activities which must be carried on for long periods should be of low intensity.

Emotions which affect fatigue are excessive worry, anxiety, excitement, fear, and boredom.

JUNIOR Worry, anxiety, excitement, and fear tend to consume energy, depending on their intensity.

As energy is consumed by conditions not essential to motor movement (tension, fear, anxiety, excitement), lesser amounts of activity may lead to fatigue.

A wholesome atmosphere with understanding leadership and minimum stress can assist in preventing undue fatigue.

When an individual tires, finer coordinations are lost first, then larger ones; all activities become clumsy.

JUNIOR Fatigue has progressive effects. The sense of timing is first to fail. Then, errors and accidents begin to appear; overall grasp of the operation begins to fade; attention is shifted from performance of the task to discomfort of the body; deterioration of the skill becomes rapid.

When the athlete fatigues he can no longer perform the fine skills which he had in his possession when he was fresh; he shifts to tasks employing grosser movements.

Each individual must learn to recognize the onset of fatigue, assess its degree, and learn how to control the affecting factors.

Fatigue is detrimental to optimum as well as maximum physical performance. In relation to fatigue, activities must be selected in terms of type, duration, and frequency of movement.

Muscles used over a long period of time tend to lose their efficiency and, if activity is continued, exhaustion may follow.

ELEMENTARY One possible reason for muscle soreness is lack of blood supply to the muscle; another reason may be injury to the muscle itself.

JUNIOR Activities may need to be simplified and adapted to the structure and functions of the body, especially in relation to fatigue factors.

Rest, in a horizontal position, preferably with legs elevated, should be provided between bouts of strenuous activity; massage apparently assists in more rapid recovery. Mild exercise that promotes blood flow through the legs is preferable to inactivity in a standing or seated position.

SENIOR In maximal work, the performer enters the overload zone in which a steady state of activity cannot be maintained, and fatigue or exhaustion appear.

The accumulation of acid waste in the exercised muscle is due in large part to insufficient circulation of the blood; as a result, the amount of oxygen supplied to the muscle is not sufficient to oxidize the lactic acid, nor can it be removed from the muscle by diffusion into the circulating blood.

Unless the stimulus is great, fatigue reduces the number of fibers that respond to repeated muscular contractions; reduction in the number of contractile elements reduces the total strength of contraction.

The distinction between moderate and hard work is made on the basis of metabolism, which relates to the individual's capacity for supplying oxygen to his tissues.

Moderate work is defined as that amount of activity which uses energy at a rate of about three times the basal metabolic rate; this can be carried on for long periods without undue fatigue.

In hard work the use of energy ranges between three and eight times the basal metabolic rate, and fatigue ensues more rapidly.

The trained or conditioned person develops the ability to increase the amount of activity prior to fatigue and to recover more rapidly from exertion.

ELEMENTARY Standing still is more tiring than vigorous walking, due to reduced circulation in the legs.

Strong muscles fatigue less quickly than do weak muscles.

JUNIOR The athlete, in order to improve his performance, exposes himself almost daily to the dull aches of muscular effort and the laborious breathing accompanying the discomfort of fatigue. Blood coming back to the heart and through the lungs and then on to the brain helps reduce the onset of fatigue, because the oxygen supply is maintained.

To delay the onset of fatigue one should develop smooth, rhythmical skills at effective levels of speed.

Recovery from fatigue occurs more quickly if strenuous activity is followed by a gradual decrease in activity over a period of time; this stimulates circulation of the blood.

Oxygen is necessary for recovery from fatigue. If a muscle is supplied with plenty of oxygen it does not become fatigued as rapidly.

Since oxygen can come to the muscle only via the blood stream, any adjustment that increases the amount of blood going to the exercising muscle will thereby postpone fatigue, and by so doing increase endurance.

Improved cardiorespiratory endurance delays the onset of fatigue.

SENIOR Chemical analysis has revealed that the amount of glycogen is less in the fatigued muscle than in the normal muscle.

During exercise the trained person is able to maintain blood sugar levels for a longer time and show a greater rise in the blood cholesterol and fat content, thus demonstrating greater utilization of body stores.

Lactic acid produced in exercised muscle is disposed of first by neutralization and then by oxidation and resynthesis into glycogen.

Chronic fatigue is fatigue which is not relieved by a good night's sleep, and is frequently known as "staleness." This may be accompanied by one or more of the following: tiredness, loss of interest, increased effort needed to carry out usual tasks, increased irritability, general emotional instability, boredom, loss of weight, poor dietary interests, increase in resting pulse rate, lowered blood pressure, tremor of outstretched hands, and pallor.

JUNIOR The possible effects and symptoms of chronic fatigue include diminished capacity for doing effective work; tiredness; sleepiness; soreness in muscles; stiffness in joints; swelling in hands and feet; inability to keep attention fixed; loss of memory; failure to grasp new ideas; difficulty and slowness in reasoning; and pain.

Chronic fatigue will show considerable variation depending on age, sex, and body build.

Rest from activity may renew the desire to be active and make possible an early recovery from staleness.

Change of activity will frequently serve as a stimulant to performance when returning to the original activity.

SENIOR Physiological fatigue is not the only factor which influences performance and the development of chronic fatigue; psychological factors also play an important role.

STRESS

Stress is a state in which the homeostatic balance of the body is upset; as a result, physical performance will be affected as well as the reactions of the organism to the activity.

ELEMENTARY Placing too much emphasis on winning or bettering one's own score may result in poorer performance, because of stress.

Desire to succeed and the setting of goals for accomplishment should result in the right amount of stress to aid in improved performance.

JUNIOR During stress, performance patterns change.

Causes of stress, known as stressors, may be psychic, physical, or social agents or conditioners.

Normal amounts of tension exist with any type of physical activity; this stress can aid rather than hinder performance.

SENIOR Some of the stressors which may modify performance or the effects of activity on the individual are fear of performing the activity; overanticipation or excitation prior to participation; self-consciousness because of observers or spectators; tension from environmental temperature; increasing physical exertion; and level of aspiration.

There is individual variation in the response to stress.

SENIOR What serves as a stressor for one person may not be so for another; each person must learn to identify his own stressors and their effects.

Some individuals are able to eliminate or reduce stressors by a reinterpretation of the stress; physical performance may then be unaffected or even enhanced.

Each individual must learn to determine the causes of stress in himself, evaluate these objectively, and assess the effects on his emotions and performance.

Performing an activity incorrectly may create a stressful situation.

ELEMENTARY As skill is improved, unnecessary muscular tensions are usually reduced.

JUNIOR The physiological effects of exercise may be detrimental rather than beneficial if the activity itself results in increased tension due to incorrect performance.

SENIOR The inappropriate, extraneous movements of the unskilled performer may result in his becoming overstimulated, so that energy spills over into surrounding musculature and produces interfering tensions.

Stress may operate as either a positive or negative motivator of performance.

JUNIOR Many individuals need the stimulus of stress to enhance performance.

Activities that are normally beneficial to the human organism may be detrimental when performed during stress.

SENIOR Tension prior to performance may be accompanied by nausea, rapid heartbeat, throbbing in the head and throat, pain in the lower back, desire to urinate, and cold perspiration; these states may be normal for some athletic competitors.

If a performer "feels" ready, he usually does well, even though experiencing great stress; if he interprets feelings of tension as a sign of distress, resulting movement patterns will probably be less effective.

Physical activity itself may serve to alleviate some types of physical, mental, or emotional stress and thus be especially good for the organism under stress.

JUNIOR One reason for engaging in physical activity at a particular time may be to alleviate stress and help the participant to feel more normal.

Gross body movement, as well as successful skilled performance, has the potential for aiding in the dissipation of the products of stress.

Movement itself is a stressor affecting subsequent performance and the effects of activity.

SENIOR Because of stress, the competitiveness of the situation and the physical demands of the activity must be considered in determining whether or not the activity will be beneficial physiologically and psychologically.

Physical activities usually involve some psychological elements which may intensify the encroachment of the stressor upon the body in even the mildest game situation.

Work-producing aids may be environmental and include heat, massage, shower baths, differentiated warm-ups, training routines, and stimulative substances.

JUNIOR Aids may be beneficial to some athletes and not to others.

SENIOR The nature of work-producing action of various substances or procedures on the various bodily functions is not well established.

Because the type of activity may determine the kind of aid which would improve performance, the relationship of the aid to the activity should be analyzed.

Performance aids modify activity and performance through direct action on muscle function.

JUNIOR The primary purpose of performance aids is to improve immediate performance or to hasten recovery, or both.

SENIOR Research results suggest that some aids such as moist or dry heat favorably influence the heart and circulatory system in sports activity.

Athletes should study the physiological and psychological bases for improved performance and the physiochemical agents involved.

Massage prior to sports performance is of little value, and further study is needed to determine the value of warm-ups prior to vigorous activity.

JUNIOR Formal warm-ups (exercise similar to the activity for which the performer is getting ready) are more valuable than exercise using general free movements to raise muscle temperature.

Knowing that the value of warm-ups must be judged on an individual basis, the athlete can modify his preparation for competition to suit his own needs.

SENIOR In analyzing his performance, the athlete must understand the dangers and limitations of special aids.

An increase in fuel supply for muscular contraction may be provided by some performance aids.

JUNIOR It has been shown that fatigue can be delayed by the action of some performance aids on the respiratory and nervous systems.

There is evidence that some aids contribute to speed of recovery from fatigue and that these aids can be used effectively.

Specific studies show that oxygen administered prior to swimming short distances may increase speed.

Oxygen administered to track athletes does not seem to increase speed or endurance in running nor hasten recovery after exertion.

In some instances performance aids counteract the development and effect of fatigue products.

The effects of some performance aids may be more psychological than physiological.

SENIOR The use of some performance aids may contribute to the removal of inhibitions to all-out performance.

Motivation to perform at a high level is influenced by individually acceptable aids.

Recognition of the relationship of motivational factors to sports performance may help the individual in decisions concerning the use of performance aids.

Knowing that performance is influenced by psychological readiness and that stimulating procedures contribute to this readiness, the student can judge his performance more objectively.

The athlete must recognize the emotional appeal in advertising of miracle ingredients or processes to aid performance, and must make critical assessment in terms of the effects on his maximum physical effort.

Mechanical, thermal, and chemical factors modify the functioning of the body and influence physical efficiency.

JUNIOR Ice packs applied to the abdominal region hasten recovery from strenuous exercise; the application of cold causes blood to flow to the extremities and facilitates the return of waste products. Decisions on the use of external aids should be made on the basis of whether or not performance is improved without harm to the performer.

SENIOR Because the regulatory physiology of the body may be adversely affected by some aids, physical performance may be modified and its effects lessened.

Research findings vary somewhat concerning the effect of diet-related substances on the improvement of sports performance.

JUNIOR Conflicting research results have been reported on claims made for special effects of gelatin in the alleviation of fatigue or the increase of endurance and on the effectiveness of wheat germ and wheat germ oil in improving performance.

Knowing that some aids benefit certain athletes without affecting others, each individual must make his own decision concerning their use.

SENIOR The kind of aid which will benefit physical performance may be determined by the type of activity practiced.

Some substances used to improve performance may be too dangerous to use or may be unethical to use; those which are safe and acceptable have not been proven universally effective.

SMOKING

Studies of the effect of smoking on physical performance have shown detrimental effects on strength, endurance, and recovery from fatigue.

ELEMENTARY Since smoking is believed to be especially harmful during adolescence, it is important to understand its effects on activity and the reasons for these.

JUNIOR It is desirable to abstain from smoking if maximum endurance and efficiency are to be maintained.

SENIOR Smoking may provide a temporary stimulus, but this is followed by a depression of bodily processes.

Smoking may cause dizziness, rapid pulse, and digestive disturbances, and may thus reduce effectiveness in physical performance.

JUNIOR It is important to understand that the nonsmoker enjoys better digestion, may live longer, has steadier nerves, and should have better endurance than the smoker.

SENIOR There is evidence to show that excessive smoking speeds up the heartbeat, slows circulation, raises blood pressure, affects the stroke volume of blood, and affects motor performance.

It is also believed that lower athletic efficiency of smokers is due in part to higher heart rate and inability of the heart to fill properly between beats, thus reducing blood flow per minute. It should be recognized that tolerance to the effects of tobacco may be acquired with continued smoking.

Nervousness, as evidenced by unsteady hands, has been noted in heavy smokers and may affect precision activities.

ELEMENTARY Smoking contributes to unsteadiness in tests of precision activities.

JUNIOR It is significant to an athlete that in sports requiring accuracy, such as archery and riflery, proficiency may be impaired by smoking.

Carbon monoxide in tobacco smoke reduces the physical endurance of the smoker.

SENIOR Inhalation of carbon monoxide in tobacco smoke modifies the hemoglobin in the blood and reduces the amount of oxygen which can be transported from the lungs to the muscles.

Knowing that carbon monoxide reduces the oxygen supply to the muscles, the student can understand the relationship of smoking to endurance.

Smoking contracts the blood vessels, slows the circulation of the blood, and prevents maximum distribution of nutrients in sustained activity.

JUNIOR Knowing that some studies have shown that nonsmokers perform better in sports than smokers, it is possible for the student to make sound decisions concerning smoking.

Acute impairment of pulmonary function has been demonstrated in young smokers as compared to young nonsmokers.

Significant decreases in maximum breathing capacity of smokers have been demonstrated in several studies.

JUNIOR Research in swimming the 100-yard swim has indicated that the average time of nonsmokers was better than that for smokers.

In some studies of endurance running, nonsmokers performed better than heavy smokers or moderate smokers.

SENIOR In athletic performance where maximum effort must be developed, sustained smoking impairs the ventilatory capacity and affects performance unfavorably.

Alcohol as a depressant, not a stimulant, affects motor performance.

JUNIOR Because the consumption of alcoholic beverages is a common practice in many societies, all individuals need to know how this can affect motor performance.

Alcohol has an adverse effect on finer coordinations and movements, even when consumed in small quantities; gross motor coordinations are also affected when alcohol is consumed in larger quantities.

Alcohol depresses reflexes and interferes with coordination.

The smallest amounts of alcohol in the blood stream can affect the region of the brain responsible for judgment, which in turn can affect proper motor activity.

Under the influence of alcohol, self-control is lessened and muscular coordinations are less subject to control.

In order to perform at an optimum level in competitive sports, players should not consume any alcoholic beverage before practices and games.

After drinking even small amounts of alcohol, persons may be unable to perform with accuracy any tasks which require physical skill and motor coordination.

As a food, alcohol does not provide the vitamins, minerals, or proteins essential to physical growth and development or for vigorous physical activity.

JUNIOR Alcohol is not a good energy food because it cannot be oxidized rapidly enough to give the energy needed for continued vigorous activity.

Alcohol does not overcome fatigue; it merely tends to obscure the feelings of fatigue temporarily.

The oxidation of alcohol increases very little during exercise, as contrasted to many other types of food.

Alcohol, as an anesthetic, has an undesirable effect on muscular activity.

JUNIOR Motor memory and learning are perceptibly affected by even small amounts of alcohol.

Alcohol is absorbed into the blood stream through the walls of the stomach, thus affecting rapid results in terms of motor activity.

Because alcohol enters the blood stream so quickly, it rapidly depresses the central nervous system and immediately affects motor neuron activity.

Since alcohol may lessen or deaden pain, an athlete who has consumed alcohol may not be aware of the extent of an injury; in such a situation continued play could result in permanent damage.

SENIOR The brain is enmeshed in a heavy network of blood vessels and as a result is more directly affected by the concentration of alcohol in the blood than is any other part of the body; in turn, motor messages from the brain to the muscles can be seriously affected.

With increasing depression of the cortex due to alcohol there is noticeable loss of coordination, the senses of touch and pain are blunted, double vision and dizziness are common, speech is thickened or slurred, and staggering is common.

Reaction time, vision, muscular strength, and endurance, all vital to successful physical performance, are impaired by the consumption of even small amounts of an alcoholic beverage.

DRUGS

Drugs affecting the functioning of the body can alter one's ability to perform physical activity.

ELEMENTARY

Because of the effect of drugs on performance, they should be taken only when prescribed by a physician, with the knowledge of the parents and the teacher of physical activity.

The body does not function normally when under the influence of drugs, except where a drug has been prescribed to overcome some medical defect. The performance of physical activity will be affected, and the desirable effects of physical activity may be modified to some degree.

Individuals differ in their reactions to drugs; a drug which is safe and effective for some people may have disturbing side effects for others, and these affect physical performance.

JUNIOR

Overuse or inappropriate use of any drug can contribute to disturbance of desirable social relationships in sports and dance situations, poor skill performance, physical breakdown, and mental illness.

Everyone must realize the dangers of participation in any vigorous or demanding physical activity for anyone under the influence of drugs.

One should study current scientific information about positive and negative effects of specified drugs (such as benzedrine, cocaine, caffeine, and barbiturates) on physical and mental performance, and know how drugs may modify one's social behavior and the desirable effects of physical activity on the body.

Aspirin is a drug, but when taken in proper amounts in relation to age and physical condition, it will have little or no undesirable effect on performance, with the possible exception of slowing reaction time.

ELEMENTARY

Aspirin is the most commonly used drug on the market and is taken by people of all ages, with or without a physician's advice.

People can become ill or irritable and less skillful in physical activity if they take too much aspirin.

JUNIOR

Each person must learn his own tolerance for aspirin and how it affects his performance in physical activity; he must then modify his activity accordingly when taking aspirin.

Antihistamines may cause dizziness, drowsiness, and poor coordination; they may hinder one from playing vigorously and skillfully.

ELEMENTARY

Some antihistamines can be bought without a prescription; taking many of these may have an adverse effect on one's skill performance in game and dance situations.

JUNIOR

Strong antihistamines usually require a physician's prescription, and his advice should be heeded regarding participation in physical activity while taking them.

Each person must learn his own tolerance for antihistamines and how they affect his performance of physical activity and his social behavior; he must then modify his activity accordingly when taking antihistamines.

Some people are allergic to penicillin and must not take it; some cannot perform physical activity as effectively while taking it; others can function normally, and physical activity will have its usual desirable effects on the body.

JUNIOR

If a physician prescribes penicillin, he should include advice about participating in physical activity while under its influence; this advice should be relayed to the physical education teacher.

The physical condition of a person which causes the need for penicillin may also be such that physical activity at that time would be harmful and would delay recovery from illness.

If the influence of penicillin on the individual is such that coordination and other aspects of skillful performance are impaired while taking it, vigorous sports or dance activity should not be attempted.

Tranquilizers and barbiturates make a person more relaxed and slow up body reactions and coordination.

JUNIOR

While under the influence of depressant drugs, one must eliminate or modify participation in activities, according to the advice of the physician.

A small amount of phenobarbital may help the performance of a person who is very nervous or excitable due to some illness or disability, but only if a physician prescribes it; the physician having been told the exact nature and extent of physical activity in which the person intends to engage.

While under the influence of barbiturates it may be dangerous to attempt activities requiring high degrees of motor coordination and quick reaction.

SENIOR

Depressant drugs have marked effects on the central nervous system and the endocrine glands, affecting the performance of physical activity and modifying its effects on the body.

Depressant drugs have marked effects on social behavior in game and dance situations.

Strong pain-relievers can cause respiratory and circulatory depression, dizziness, difficulty in coordination, and muscle spasms.

ELEMENTARY

Strong pain-relievers, because of their possible side effects, may affect all aspects of daily living, especially participation in physical activity.

Strong pain-relievers require a prescription from a physician, and his advice is needed concerning participation in physical activity while under the influence of these drugs.

Participation in vigorous competitive sports should be avoided while under the influence of a strong pain-reliever.

JUNIOR

Strong pain-relievers affect the nervous system by blocking out certain normal reactions and interfering with motor coordination.

Participation in vigorous, competitive sports or other activity while under the influence of a strong pain-reliever such as injected novocaine may result in injury, or an injury may become seriously aggravated, because the normal pain protective mechanism has been blocked.

Codeine, a drug often found in cold and cough medicines, may affect physical performance, and activity while under the influence of codeine may have an adverse effect on the body.

ELEMENTARY To avoid injury or impairment to one's health, physical activity may need to be modified or eliminated if one is taking a cold or cough medicine containing codeine.

Because physical performance may be dangerous while under the influence of codeine, a physician's advice is needed concerning its use and the individual's subsequent participation in vigorous activity.

JUNIOR Codeine affects the nervous system by eliminating some reflexes and slowing up body reactions; thus physical performance will be less skillful and may be detrimental to one's health.

The caffeine and cocaine in coffee, tea, and cola beverages may or may not have adverse effects on physical performance and effect of physical activity on the body; this is an individual matter, in terms of quantity consumed.

ELEMENTARY Coffee, tea, and cola drinks contain drugs in small quantities; they stimulate, and too much stimulation may be harmful, especially in terms of participation in vigorous physical activity.

SENIOR Anyone engaging in sports competition or other vigorous physical activity should learn his own tolerance for caffeine beverages in relation to optimum performance and beneficial effects of activity on the body.

Drugs of the benzedrine type, often taken to induce wakefulness, to experience feelings of elation, or to lose weight, may cause lasting sleeplessness and impair physical activity.

JUNIOR Under the influence of benzedrine drugs, physical performance and motor coordination may be impaired, and one's health may be endangered by performance of vigorous activity.

Benzedrine drugs may cause sleeplessness, restlessness, gastrointestinal disturbances, irritability, and poor motor coordination.

For optimum physical performance and the best effects of physical activity on the body, one should never take a benzedrine drug unless a physician prescribes it, and then activity should be limited or even eliminated. The physician's advice should be followed concerning the type and extent of physical activity while taking the drug.

SENIOR Benzedrine ("pep") pills do not increase the functioning of the muscles, heart, or lungs, but they may drive a performer to his maximum limits of safe performance, or beyond those limits.

These drugs often have the effect of making a person reckless in his judgment of what activities he can perform safely, enhancing possibility of injury.

NATURE AND USE OF STANDARDIZED TESTS

To measure understandings about the body of knowledge in physical education which is presented in this manual, the teacher can use standardized tests published by the Educational Testing Service (ETS). These tests, the AAHPER Cooperative Physical Education Tests, contain questions that deal with the subject matter in physical education. Each test question is a multiple-choice type in which the student chooses one of four possible answers. The student's score on the test tells how well he understands the various kinds of physical activity, their values and effects.

Teachers who have made their own tests frequently find that teacher-made tests do not work as well as they had hoped. When a test is built by an organization that specializes in test construction, the results usually are more satisfactory. The test-making organization may encounter the same problems that confront the teacher, but is able to build a better test because of greater resources.

Teachers can make useful tests, and have done so, but because so much time and effort is required, many teachers would prefer to use published tests. However, some teachers hesitate to use standardized tests because they are uncertain whether such tests are suitable for their instructional programs. These teachers would be reassured about the value of published tests if they knew more about (1) how the standardized test is built and the meaning of scores produced by a standardized test, (2) the ways in which standardized test results may be used, and (3) the limitations of the test situation and testing. These three points are described in the following pages.

BUILDING THE STANDARDIZED TEST

There are at least six steps in building a standardized test: (1) planning the test, (2) writing the test questions, (3) trying out the questions experimentally, (4) assembling the test, (5) determining test reliability and validity, and (6) developing interpretive data.

Planning the test

In the beginning, a decision is made to construct a test. The American Association for Health, Physical Education, and Recreation (AAHPER) through its Research Council, had developed tests to measure physical fitness and a variety of sports skills. The Association, wishing to round out a more complete evaluation for physical education programs, asked a group of leaders in the field to help develop a sports knowledge test which was later expanded to become a test of the body of knowledge in physical education. This group functioned in a manner similar to the test advisory committees used by test-making organizations.

Testing organizations, such as ETS, build tests with the help of advisory committees made up of subject matter specialists in the field for which the test is intended. The test development organization may not be familiar with the content and depends upon the advisory committee to identify the understandings that children should acquire in their instructional programs in schools. The advisory committee often helps with the actual construction of the test by writing test questions and by reviewing questions written by others. The members of this important committee usually are selected for their reputations as authorities in the content of their special fields and for their understanding of and interest in measurement and evaluation. The advisory committee usually is composed of persons from different parts of the country, and an attempt is made to include persons from different kinds of schools and colleges.

The advisory committee has three important jobs. The first is to identify the body of knowledge which is to be measured by the test. The committee selects content that is accepted by the profession as representing important outcomes of instruction regardless of the manner in which the subject matter is taught in different schools. Specifically, it tries to avoid statements which would be understood only by students who attend certain schools. Second, the committee assigns levels to all of the content it has identified. The body of knowledge in physical education covers instruction in grades 1 through 12, but has been classified into elementary, junior high, and senior high school levels for assignment to three levels of tests. Third, the committee decides what proportion of subject matter will be covered in each of the [illegible] at the three levels. The committee's decisions should be consistent with the proportion of time and emphasis which is given to the subject matter in the school program.

When the advisory committee selects the subject matter, classifies this material by grade level, and assigns proportional emphasis to the content, it is formulating a kind of blueprint for the construction of the test. Usually, another dimension is added to this blueprint by designating the proportion of test items that will measure the three fundamental skills of remembering, understanding, and thinking. Understanding is the most important skill for the body of knowledge in physical education. Understanding means being able to translate materials into a different form, as in understanding symbols of movement in the dance or understanding the meaning of scores in a tennis match. Understanding also means being able to apply what one knows, such as selecting the correct principle and using it in the solution of a problem. The skill of remembering information such as facts, rules, procedures, or techniques for performing activities is more important in the early grades than is the skill called thinking, but in the later grades, thinking become more important than remembering. Thinking involves the ability to understand the elements of a problem and the relationships among these elements. These relationships become the basis for solving problems. An umpire uses the skill of thinking when he calls a play in which several incidents occur and the decision is based on the interrelationship among the incidents. To analyze a situation and to make accurate generalizations on the basis of an analysis are also thinking skills.

The multi-dimensional blueprint for a test can be conveniently worked out by preparing a two-way grid, with subject matter as one dimension and cognitive skills as the second dimension, which provides grid boxes in which to indicate the proportion of questions assigned to a given category of subject matter and skill. The following grid illustrates the form of test blueprint used for the AAHPER Cooperative Physical Education Tests.

	SKILL			
Subject-matter	Knowing	Understanding	Thinking	Totals
Activities				
Effects of Activities				
Factors modifying activities				
Totals				

3

The specifications for a test often take other factors into consideration. The following five assumptions underlay the development of the AAHPER Cooperative Physical Education Tests.

1. The tests measure understandings in physical education. Athletics, intramurals, health, and recreation are included only insofar as they are a part of the content of physical education.

2. The tests measure understandings about the body of knowledge in physical education. The tests do not measure the general scholastic ability of the student, nor do they measure achievement in basic subjects, such as chemistry, physics, biology, psychology, etc., except where specific application is made to physical education.

3. The understandings sampled in the test are accepted as being so important for the student to acquire that all schools should give them attention.

4. The test is fair to pupils who have had various amounts and kinds of instruction. However, it tests for what the pupils should have learned in a program that the profession considers to be sound.

5. Although most questions are fair to boys and girls alike, in certain instances the materials will be more familiar to one sex or the other. Although this situation should balance out, the advantage is to the person who achieves well in areas familiar to both sexes.

With the specifications described above as guidelines and with the body of knowledge identified, as presented in the earlier parts of this manual, test items can be written.

Writing the test questions

When the specifications for the test have been prepared by the advisory committee, the test is ready to be built. If all goes well, the finished test will follow the blueprint plan. The arrangements that the testing agency makes for questions to be written for the test will vary, depending upon the nature of the test. Sometimes the advisory committee writes most of the questions. It is also common practice to call upon persons in the field of specialization in addition to the advisory committee to contribute questions to the test. Where content specialists have trouble devising questions because of the complex nature of the ability to be tested, the testing agency may assign some of its own staff members to the task of writing test questions.

For the AAHPER Cooperative Physical Education Tests, the test question writers were the test advisory committee and fourteen other specialists in physical education who had been nominated by members of the advisory committee. The fourteen were selected to represent the three school levels (elementary, junior high, and senior high), both sexes, all regions of the country, and both school and college affiliations. Persons were selected who were measurement specialists or test authors or whose training and experience equipped them to write objective test questions with assistance from test specialists.

It is common practice for a test-making organization to conduct inservice workshops for test-question writers. Even test-writing professionals are challenged to produce test questions that measure understandings in the way intended. The advisory committee and the fourteen test-question writers met for a two-day workshop. At the workshop, the writers heard an explanation of the philosophy of teaching a body of knowledge in physical education and of the approach taken by the advisory committee in developing the content materials upon which the tests were based. Test specialists from ETS presented the plan for developing the tests and conducted a discussion session of certain do's and don't's of test writing. Members of the group tried their hand at writing test questions and submitted their efforts to the criticism of their colleagues.

At the conclusion of the workshop, assignments for writing questions in the various areas covered by the test specifications were made. By asking each person to write twenty-five test questions in his assigned area, it was expected that enough suitable questions would be produced to put together nine pretests, three forms at each of three school levels, with each form containing fifty items, and that from these pretests it would be possible to produce six final forms, two at each level.

The type of test question selected for the AAHPER Cooperative Physical Education Tests was the multiple-choice question with four responses. This is the objective type most commonly used by test-making organizations. Other types of questions such as true-false and matching questions are considered to be less useful. True-false questions can be answered correctly half the time by pure guess, and their nature makes them more suitable for testing content involving straight factual recall. Matching questions, which appear to require the ability to solve puzzles, are also better suited to testing the recall of factual information than to measuring the student's understanding of the materials. Multiple-choice questions are used more widely than essay questions because they permit the student to answer more questions on more topics, thereby contributing to higher test reliability and broader coverage of subject matter. Also, the person writing questions of the multiple-choice type can control the boundaries of the student's response, which helps to define more closely the limits of the question. Finally, multiple-choice questions, like other questions of the objective type, can be scored quickly and inexpensively with less possibility of scoring error.

Multiple - choice questions themselves have sometimes been criticized as not being useful when the purpose of the test goes beyond the measurement of remembering. This criticism is not necessarily true. When they are well written, multiple-choice questions can be effectively used to measure all levels of cognitive skill, including interpreting, analyzing, synthesizing, and evaluating. They are especially useful for testing the ability to apply concepts or principles in new situations, and this is the kind of skill that the AAHPER Cooperative Physical Education Tests are designed to measure.

As the test-question writers for the AAHPER Cooperative Physical Education Tests carried out their assignments, they strove to meet the high standards of excellence that characterize the ETS product and that would be needed to produce satisfactory tests of understandings of the body of knowledge in physical education. They knew that useful questions must require thought by the student, and not merely the recall of trivial information. While some items test for factual information, others test the ability to apply knowledge or to think critically, and for these items, the writer must create questions that cannot be answered on the basis of factual information alone. The writers were aware of the difficulty of putting questions into language so simple, direct, and free of ambiguity that they would be understandable to students in the schools, especially children in the early grades. The writers knew, also, how difficult it is sometimes to limit a question to a single, central idea or concept, and to be certain that all of the choices for responses are related to that idea. In short, the job of the test-question writer is a challenge, and it takes hard work, perseverance, and considerable skill to write questions that will stand up to the screening they are subjected to after they are written.

It is routine for test-making agencies to scrutinize newly-prepared test questions and to screen out those questions that appear not to be acceptable. After the questions for the AAHPER Cooperative Physical Education Tests were written, ETS sent them to members of the advisory committee with instructions to rate each question as to its significance, i.e., its relevance to the content of physical education, its difficulty, its clarity, and the correctness of the keyed response. The raters were asked to edit any of the questions that could be improved. Members of the Test Development Division of ETS met with persons on the advisory committee to make decisions about questions presenting problems and to determine what additional questions would be required to fill out the pattern of the original specifications for the test. Additional writing assignments supplied the needed questions, and the questions were then ready for experimental tryout.

Trying out the questions experimentally

When the test-question writers finish their work, the testing agency prepares and administers preliminary forms of the tests with many more items than will be eventually needed and then uses these pretest data to analyze the questions and assemble the final forms of the tests. The pretest will show how difficult the questions are and how effectively the questions discriminate the knowledgeable from the uninformed students. Pretesting enables the testing agency to assemble tests which will accurately measure understandings about the body of knowledge in physical education.

The first step in pretesting is to select schools where the students are taught understandings about physical education. While it would be ideal to use only schools where instruction covers all of the content described in this manual, the fact is that not many such schools are likely to be found. The teaching of understandings about physical education is just beginning to emerge as an important objective of the profession. Nevertheless, ETS sought schools where such teaching is going on, if only in part, because pretest data are more useful when students have received some instruction in the content which the test covers.

The data from the pretesting are analyzed statistically to show the difficulty and the discriminating power of each question. Questions which are too difficult or too easy are revised, if possible, or discarded. Tests have been found to be most effective when the majority of questions tend to be answered correctly by about half those being tested. Questions discriminate effectively when persons who score high on the test as a whole tend to get the question right and persons who score low on the test tend to get the question wrong. This kind of analysis also tells something about the three incorrect choices for each question. These three "distractors" should look equally attractive to a person who does not know the answer and merely guesses. If any of the three distractors is rarely selected by persons answering the question incorrectly, it may be suspected of being a poor distractor. Perhaps the wording gives it away as an obvious wrong answer. The danger here is that students who are guessing have a higher probability of guessing the correct answer when only two of the distractors are functioning properly. If two of the three distractors are not functioning, the item becomes in effect a true-false question which the student has a 50-50 chance of answering correctly by pure guess.

Assembling the test

After analyzing the pretest data for difficulty and discriminatory characteristics as well as the characteristics of responses to the incorrect alternatives, the professional staff of the test-development agency assembles the final form of each test. Throughout this process, judgments must be made about the usefulness of each question. Some questions will be discarded, some will be reworded to remove ambiguous wording, some distractors may be replaced, but many will be used without change. The original plan of test specifications (the blueprint) is frequently consulted as the final test form is assembled to be certain that the test content conforms with the distribution of content originally intended. After the test is assembled, it usually is reviewed by several persons, including members of the advisory committee, at which time last-minute important changes may still be made. After final review, the test forms are processed for printing.

At this point the test is ready, but there remains the task of developing norms and preparing norm tables to aid in interpreting scores. These norms are constructed by administering the test forms to students from a large number of schools that are selected to be representative of the geographic areas of the country. By the use of appropriate statistical procedures, raw scores are converted in such a manner that the converted scores on different forms of the test can be compared. When placed in norm tables, these converted scores may be used to describe the characteristics of performance of specified groups of individuals.

In the norming of the AAHPER Cooperative Physical Education Tests, ETS faced the same problem that it had in the pretesting, namely that there were not enough schools to be found where instruction covering the content of this manual was being offered to permit the random selection of a sample. It was deemed better to identify a number of schools where such teaching was being done and to select from among those schools as representative a sample as possible. The norms are, therefore, not national norms in the usual sense, but are "national" norms on a carefully selected group of schools pursuing the kind of instructional program presented in the manual.

Determining test reliability and validity

Because of the care with which the test questions are written, the cautious screening of questions, the analysis of difficulty and discrimination of the questions based on data obtained in the pretest, and the care with which the final test forms are assembled, there is every expectation that the test that is produced will measure student performance reliably and validly. Yet reliability data must be computed and evidence of test validity must be procured to demonstrate that the test is doing the job for which it was constructed. For example, it might be possible to compare schools where there is known to be model instruction in the content of physical education with schools which do not have such instruction among their objectives. Higher scores on the AAHPER Cooperative Physical Education Test in the former group of schools might be taken as evidence that the test is validly differentiating between students who have acquired understanding in physical education and students who have not. The relationship of test scores to external criteria such as the divergent groups described above provides needed evidence of test validity. External criteria are not always easily found, but they make possible the research needed to demonstrate the usefulness of the test for such purposes as prediction, diagnosis, placement, and evaluation of programs.

Developing interpretive data

For each of the AAHPER Cooperative Physical Education Tests, scales are provided which are used to transform raw scores into converted scores, and there are norms tables which help to interpret these converted scores. These are included, along with other information about the tests, in the handbook which accompanies the tests.

The converted score scale is developed by a process of statistical equating that permits converted scores from different test forms to be compared. As an example, if one student takes Form A of the elementary level test and another student takes Form B of the same level test, their converted scores can be directly compared even though one form may be harder than the other. Also, if a student takes Form A of the elementary level test at the beginning of the school year and then takes Form B of the same level test at the end of that year, his converted scores may be compared to tell something about the understandings he has acquired in physical education during the year.

Statistical equating also permits converted scores on tests taken at different grade levels to be compared. This kind of equating makes it possible to compare the test performance of a fourth grade student with the performance of a student in any other grade from 5 through 12. Also, the progress of the same student can be traced over a period of years by comparing his converted scores on different forms and different levels of the test as he moves from one school grade to the next and from one school level to the next.

The norms tables are based on the test performance of students from a number of selected schools from different areas of the country. The norms are expressed in percentile ranks, which tell a student where he stands in relation to other members of the group on which the norms are based. For example, a student whose converted score has a percentile rank of 85 has scored better than 85 percent of the students in the group represented by the norms. This means that only 15 percent of the students in such a group have scored better than he.

The percentile ranks in the norms tables for the AAHPER Cooperative Physical Education Tests are shown with percentile bands. These bands cover a span of percentiles. For example, a certain converted score might show a percentile band of 91-98 in the norms table for the test. This band is interpreted to mean that the student who makes this particular score has a good probability of standing somewhere between the 91st and 98th percentiles in relation to the norms group. The percentile band, rather than a specific percentile rank, is used to remind everyone that there is a certain amount of error in any measure of performance. This error causes a student's scores on any test to vary when he takes parallel forms of the test on successive days. Any single test score is only an estimate of his true performance, and consequently his true percentile standing is also unknown. However, the percentile band provides a range of percentiles which we can say with reasonable assurance contains his true percentile rank.

Norms tables which show percentiles for mean or average performance of class groups are also useful. Administrators can use these tables to compare mean performance of classes at different grade levels with typical performance of classes at the same grade levels in other schools. While such norms tables have not so far been developed for the AAHPER Cooperative Physical Education Tests, it is anticipated that they will soon be available.

Test scores can mean one thing when they are compared with scores for the norms groups and can mean something different within a local school system. Test scores can be given local meaning by using local norms. Any school system can construct its own local norms by using converted scores obtained from testing and scoring the students within the system. The procedures for constructing local norms are straightforward and can be carried out by any teacher who is supplied with the converted score data for the grades selected for local norming. Procedures for constructing local norms are available from ETS.

USING THE TEST RESULTS

Test scores and norms tables can be very helpful in telling students, teachers, administrators, and parents what is happening in their schools. Local norms can tell a student where he stands in his class or in his grade at his school. "National" norms can tell the student where he stands in relation to students in other places.

Local norms and "national" norms do not always tell the same thing about a student. A student can be outstanding in his class but show only middle performance on the "national" norms. This kind of comparison shows that while the student is performing well in relation to what his class is doing, students in other schools are doing so much better that his performance is only mediocre when compared to theirs. Interpretations of this kind will interest school administrators who may wish to follow up by comparing class averages on tests with mean norms for other schools. Where a class shows up poorly on such norms, the administrator may wonder whether the instructional program in his schools is what it should be. Curriculum changes and improved instructional methods can be expected to raise class standing, and administrators often rely on class test performance on standardized tests to signal the need for curriculum improvements. Similarly, administrators are always pleased to see class test performance fall into the upper half of "national" norms tables since such information is evidence of good quality instruction in the local school setting.

Teachers find test scores helpful as one factor in assigning marks in school content areas. Also, test scores help to identify students who need diagnosis and remedial work. Teachers find that test scores are helpful when they wish to determine the level of instruction which is most suitable for a group of students. Sometimes teachers like to group students according to level of achievement, and often they prefer to use test scores as the basis for such groupings. When a student moves upward into the next school level, a record of his test performance can be used as an indication of earlier progress, and the record can be continued throughout his school years. There are occasions when the guidance counselor or school psychologist working with a student having a problem would be interested in school records showing that student's progress in various content areas. Sudden changes in progress, reflected in test scores, may be a signal of something encouraging or disturbing about the student's work. Test scores also can be of use by comparing them with performance in other kinds of achievement or in other abilities.

LIMITATIONS OF TEST SCORES

While testing can be very helpful, there are limits to the ways in which test results can be used. If these limitations are ignored, the tests may end up supplying misinformation.

The scores of students on the same test may be compared to determine whether one student scored higher than the other. However, if converted scores are compared and a difference is found, there is a danger that significance may be attributed which is unwarranted by the size of the difference.

Scores may differ to some degree because of chance errors of measurement, and differences must exceed the limits of chance error before they may be judged to be real differences. Because the percentile bands in the norms tables for the AAHPER Cooperative Physical Education Tests take into account these chance errors of measurement, the test performance of two students can be more safely compared by observing the percentile bands for the two scores. If the percentile ranges within the two bands do not overlap, it may be stated with reasonable assurance that the two scores do in fact differ.

When comparing the standings of two students, the percentile bands corresponding to the two scores must be taken from the same norms tables. If the two students come from different school systems, each having its own local norms tables for the test, the percentile bands may show differences between the students which are larger or smaller than are warranted by the students' performances on the test. The only way to compare such students is by consulting a single norms table which is appropriate to both school systems. "National" norms are useful for this purpose.

While national norms for standardized tests are generally useful, they do not always provide for the most appropriate comparisons. For example, schools have become aware that national norms are not very suitable for disadvantaged students who may have no interest in the college-bound school program. These youth do not perform up to the level of others who have had greater economic and social advantages and more satisfactory home lives. The use of national norms for these disadvantaged youth only serves to emphasize the educational gap between them and their more fortunate schoolmates. Teachers and administrators should give thoughtful consideration to the need for local norms as a means of avoiding unfair comparisons with dissimilar norm populations.

There is always a danger that the importance of tests may be over-emphasized. While tests do provide information about the performance of students, the test results should be treated as only one of many kinds of evaluative information that tells the teacher and the student something about himself. When tests are used to pigeonhole students or to classify them as bright or dull, the test results may do more harm than good. Tell a student he cannot do good work and his school work will suffer. Labeling a student on the basis of his test performance is dangerous because the test score is likely to become the basis for forming a conclusion about the student rather than be used as information which is useful in helping the student to learn more effectively.

The information about standardized tests that has been presented in this chapter is brief and does not do full justice to the topic. It is intended to help physical education teachers become acquainted with pencil-and-paper physical education tests in general and the AAHPER Cooperative Physical Education Tests in particular.